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A Monograph on the Genus *Mangifera* L.

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INTRODUCTION

Early history.—Of the plants included in the genus *Mangifera* L. the trees producing mango, one of the most delicious tropical fruits, were known to the people of India since the days of antiquity. According to De Candolle (1884) mango is one of the fruits cultivated probably for over 4,000 years. Its prominence in Hindu mythology and religious observances leaves no doubt about its long history, while its economic importance in ancient times is suggested by one of the Sanskrit names, *Amra*, which also means provisions or victuals. It is repeatedly mentioned in early Sanskrit literature, e. g., *Brhatsamhitā*, *Varahapurāṇa*, etc. (Majumdar, 1935).

Foreign travelers, visiting India in the early part of the Christian era, often refer to mango in their notes (Popenoe, 1932). As far as known, Hwen T'Sang, who visited Hindusthan between 632–645 A. D., was the first visitor to bring mango to the notice of the people outside of India. He called it "an-mo-lo," a phonetic variation from the Sanskrit *amra*. Ebn Hankal (902–968 A. D.), Friar Jordanus Catalani (1328), Ebn Batuta (1325–49), Nicolo Conti (1419–44), Lurdovici de Varthema (1503–1508), and others mentioned it under various names such as *ambag*, *aniba*, *anba*, and *amba*, all of which are phonetic variations of the Indian name, *am* or *amb*, for mango. Garcia da Orta, who arrived at Goa in 1534, discussed the economic importance of mango, called by him *Mangas*, in his "Simples and Drugs of India" (published in India in 1563), and illustrated a flowering twig and a cut fruit.

The *Ain-i-Akbari*, an encyclopaedic work written during the reign of Akbar (about 1590 A. D.), the famous Moghul Emperor of India, contains a lengthy account of mango indicating that the people of India had at that time a fairly good knowledge of mango culture and the characteristics of the different varieties. Most of the improved varieties of mango under cultivation in India, the finest in the world, are the result of a determined drive by the Muhammedan Emperors to select the best fruits by horticultural methods. During that period (about

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400–500 years ago), big orchards were laid out in regions suitable for mangoes, remnants of which may be found even now.

Although the plant was known to the people of India for a long time, Carolus Clusius (1605) was the first botanist to write about mango as “*Fructus exoticus 4, a gareto acceptus.*” Bauhin (1623, 1650) subsequently referred to it under the names *Mangas* and *Amba*.

The name *Mangifera* was introduced by Bontius (1658) in the combination *arbor Mangifera*, literally meaning the tree producing mango. Rheede (1683) gives an idea of how the name *Mangifera* originated. The prevailing South Indian name *Mangas* (in Tamil) gave rise to the Portuguese *Manga* or *Mangiera*, and *Mangas sylvestris*. Either *Manga* or *Mangas* was subsequently adopted by Ray (1688), Hermann (1689, 1717) and *Commelinus* (1696). However, John Burmann (1731) retained Bontius’ name *Mangifera arbor* for mango. Burmann’s work was principally based on specimens, collected by Dr. Paul Hermann in Ceylon during the years 1670–77 (Wight & Arnott, 1834).

At that time mango, variously named *Manga indica* Ray, *Mangas domestica* Hermann, or *Mangas sylvestris* Rheede, was the only species known. Rumphius (1741) first mentioned about eight different species, occurring in Amboina and the surrounding islands (Dutch East Indies), and placed them in two different groups—*Manga* and *Pauw*.

Establishment of the genus by Linnaeus and its subsequent history.—Ultimately Hermann’s Ceylon collections reached Linnaeus, who examined them with much attention and published the results of his labor under the title “*Flora Zeylanica*” (1747) in which plants were placed into different groups. One of these, *Barbarae*, consisted of those species, the names of which are found in a list represented only in Hermann’s Museum and not supported by actual specimens. Linnaeus (1747) included mango under the name *Mangifera arbor* in this group. Subsequently in “*Species Plantarum*” (1753), he changed the name to *M. indica*, establishing the genus *Mangifera* on this simple species. Therefore *M. indica* L. has no type specimen.

Since the establishment of this monotypic genus by Linnaeus, a large number of species has been discovered and described mainly by the following authors: Loureiro (1790), Roxburgh (1814, 1824), Blume (1826, 1850), Griffith (1854), Miquel (1859), Hooker (1876), King (1896), Pierre (1897), Merrill (1923), and Craib (1931).

The first critical survey of 11 species of the genus was made by Marchand (1869) in a monograph on the *Terebinthaceae*. Another revision of the genus made by Engler (1883) in connection with his monograph of the *Anacardiaceae* dealt with 32 species, only 28 of which were valid and 4 doubtful. Since Engler’s revision of the genus the number of valid species has increased to 65, according to the “*Index Kewensis*.”

The author examined critically the large collections now represented in various herbaria in an effort to determine the status of the many species described since Engler’s revision of the genus. The necessity for a critical survey of the Indomalayan species of *Mangifera* was also stressed by Hooker (1876) in the following words: “The genus is a very

difficult one, and the Malayan species want careful revision with many specimens."

Subdivisions of the genus.—Marchand (1869) first divided the genus into 3 sections, *Limus*, *Manga*, and *Amba* on the basis of variation in the development of the disc. Hooker (1876) also recognized the necessity of splitting the genus into 2 sections for which no names were proposed. His "Section 1" includes species having a "tumid, usually 5-lobed disk, broader than ovary" while "Section II" includes species with the "Disc narrow, often reduced to the form of a stalk to the ovary, rarely obsolete in the male flowers." The two sections *Manga* and *Amba* of Marchand were merged in Section I of Hooker, but Section II was based on *Limus* of Marchand. Engler (1883) accepted these divisions of Hooker, but without assigning to them the rank of sections. Pierre (1897), on the other hand, recognized 5 sections, also based on differences in disk development: I. *Euantherae*, II. *Amba* Marchand, III. *Eudiscus*, IV. *Microdiscus*, V. *Marchandora*. But these sections are apparently inadequate because of the great variation in the disc even among closely allied species. Engler's subdivisions of the genus were adopted by Ridley (1922).

Taking everything into consideration, I am inclined to accept Hooker's conception of the genus and his division of it into two natural sections.

In delimiting species, I relied mostly on floral and reproductive characters, supported in some cases by leaf characters. The genus is divided into two sections: I. *Disc swollen, well-developed, surrounding the ovary*; II. *Disc reduced to the form of a stalk to the ovary, very short or absent*. In the latter section, the filaments are swollen and connate at the base. The most important character in distinguishing the species of Section I is the 4-merous or 5-merous arrangement of the floral parts, although an intermediate group may have 4-merous as well as 5-merous flowers in the same panicle. Another important character in Section I is seen in the varying number (5, 3, 2 or 1) of fertile stamens (those with well-developed anthers containing viable pollen grains). In Section II the mode of attachment of petals to the disc or pedicel represents the primary distinguishing character. The nature and pattern of the prominent, attractive ridges at the base of the petals present another distinctive feature in species differentiation. Other characters taken into consideration in specific delimitation are, (1) branching of the panicle (whether peduncled or fasciculate), (2) length of the panicle, (3) glabrous or pubescent nature of the panicle branches, (4) size of flowers, and (5) fruit characters. In some cases, vegetative characters, easily recognizable in herbarium specimens, have also been taken into consideration.

The present investigation is based on a critical analysis of more than 1200 herbarium sheets and preserved (alcohol) material of the genus, represented in the following Asiatic herbaria: Herbarium of the Royal Botanic Garden, Calcutta (CAL)*, Forest herbarium, Dehra Dun (DD) and Shillong (ASSAM) in India; Forest Herbarium, Maymyo, Burma (MAY); Herbarium of the Botanic Garden, Singapore (SING);

*The words in capital and small capital letters inside the parentheses indicate the abbreviations for the herbaria mentioned in the text.

TABLE 1. *Geographical distribution of the species of Mangifera.*—(Continued)

NAMES OF THE SPECIES	India	Ceylon	Andaman Isls.	Burma	Siam	Malay Peninsula	Sumatra	Java	Bali	Timor Isl.	New Guinea	Moluccas	Celebes	Borneo	Philippines	Indochina	China (Yunnan)
15. <i>M. Kemanga</i> Blume						+	+	*									
16. <i>M. khasiana</i> Pierre	+																
17. <i>M. lagenifera</i> Griff.					+	+	+										
18. <i>M. lanceolata</i> Ridl.						+											
19. <i>M. longipes</i> Griff.				+		+	+	+						+	+		
19a. <i>M. longipes</i> var. <i>glabrescens</i> var. nov.						+								+			
20. <i>M. longipetiolata</i> King						+											
21. <i>M. macrocarpa</i> Blume						+	+	+						+		+	
22. <i>M. Maingayi</i> Hook. f.						+											
23. <i>M. Merrillii</i> nom. nov.															+		
24. <i>M. microphylla</i> Griff.						+											
25. <i>M. minor</i> Blume											+	+	+				
26. <i>M. monandra</i> Merr.															+		
26a. <i>M. monandra</i> var. <i>fasciculata</i> var. nov.															+		
27. <i>M. oblongifolia</i> Hook. f.					+	+										+	
28. <i>M. odorata</i> Griff.						+	*	*				*	*	*	*	+	
29. <i>M. pentandra</i> Hook. f.						+											
30. <i>M. philippinensis</i> sp. nov.															+		
31. <i>M. quadrifida</i> Jack						+	+							+			
32. <i>M. rigida</i> Blume							+										
33. <i>M. Rumphii</i> Pierre											+						
34. <i>M. sclerophylla</i> Hook. f.						+	+							+			
35. <i>M. siamensis</i> Craib					+												
36. <i>M. similis</i> Blume							+	+									
37. <i>M. spathulaefolia</i> Blume														+			
38. <i>M. superba</i> Hook. f.						+											
39. <i>M. sylvatica</i> Roxb.	+		+	+	+											+	
40. <i>M. timorensis</i> Blume										+		+					
41. <i>M. zeylanica</i> Hook. f.		+															

* The species, marked with star, are introduced or suspected as introduced in those countries through human agency.

MANGIFERA Linn. (Fam. ANACARDIACEAE) Linnaeus, C. in Sp. Pl., 1, 200 (1753); Gen. n. 278, ed. 5 (1754); Gaertn. Fruct., 2. t. 100 (1791); DC. Prodr., 2. 63 (1825); Blume Mus. Bot. Lugd. Bat., 1. 193 (1850); Miq. Fl. Ind. Bat., 1 (b), 627 (1859); Benth. et Hook., Gen. Pl., 1. 420 (1862); L. March. Des Tereb., 188 (1869); Hook. f. Fl. Brit. Ind., 2. 13 (1876); Engler in DC. Mon. Phan., 4. 195 (1883); King in Journ. As.

Soc. Beng., 65. pt. 2, 466 (1896); Pierre Fl. For. Cochinch., t. 362-365 (1897); Ridley Fl. Mal. Penin., 1. 520 (1922); Merrill, Enum. Philip. Fl. Plants, 2, 467 (1923); Craib, Flor. Siam. Enum., 1. 342 (1931); Burkill, Dict. Econ. Prod. Mal. Penin., 2. 1401 (1935).

A genus of *trees* usually attaining immense heights. *Leaves* alternate, petiolate, entire, coriaceous or membranaceous. *Flowers* small, 4-5 merous, polygamous in terminal panicles, pedicels articulate; bracts deciduous. Calyx 4-5 partite; segments imbricate, deciduous. *Petals* 4-5, rarely 6, free or adnate to the disc, imbricate; nerves thickened into ridges, varying in number, sometimes ending in tuberculate excrescences. *Stamens* 5, rarely 10-12, inserted just within the disc, or on it, free or connate at base; 1 rarely 5 perfect with much larger anther than the others; the rest with imperfect or smaller anthers, or reduced to toothlike projections. *Disc* swollen, 4-5 lobed, or pedicillate or absent. *Ovary* sessile, always 1 celled, oblique or globose; style lateral; ovule always 1, anatropous, funicle basal, inserted on the side of the cell above its base. *Fruit* always a fleshy drupe; stone compressed, fibrous (fibre varying in length, sometimes almost absent). *Seed* large, compressed, testa papery; cotyledons plano-convex or corrugated on upper side, often unequal and lobed, generally oblong rarely kidney-shaped.

Species about 53, tropical, distributed throughout Malaysia from India and Ceylon in the west to the Philippines and New Guinea in the east, the Himalayas, Yunnan (China) and Indochina in the north to the arc of islands comprising the Sunda and Sulu archipelago in the Indian Ocean in the south.

KEY TO THE SPECIES OF MANGIFERA L.

Section 1. Disc tumid, 5-4 lobed, broader than ovary; petals free from the disk, inserted at its base; stamens inserted inside the disc at its base.

A. Petals 5 with 1-5 prominent ridges.

B. Stamens 10-12 of which 5-6 are fertile, the rest reduced to staminodes occurring between the lobes of the disc.....1. *M. Duperreana* Pierre

B. Stamens 5, all fertile.

C. Leaves lanceolate, or oblong-lanceolate, very prominently reticulated, acute or acuminate, 17-30 cm. long; petals with 6-7 ridges.....2. *M. pentandra* Hook. f.

CC. Leaves obovate-oblong, obtuse, lamina 8-15 cm. long; petals with 3-4 ridges.....3. *M. cochinchinensis* Engl.

B. Stamens 5 of which 3 are fertile and 2 reduced to staminodes.....4. *M. lanceolata* Ridl.

B. Stamens 5 of which 1-2 are fertile, the rest reduced to staminodes with small anthers, or absent.

C. Panicle tomentose to sparingly puberulous.

D. Staminodes present; panicle peduncled.

E. Fruits swollen, oblong.

F. Panicle tomentose, stout, densely flowered, leaves lanceolate, acute or acuminate; fruit big, edible.....5. *M. indica* L.

FF. Panicle branches glabrous; leaves lanceolate, thin; fruit smaller than common mango, globose, 5-6 cm. x 4 cm.6. *M. longipes* Griff.

E. Fruits compressed; panicle laxly flowered.....7. *M. caloneura* Kz.

D. Staminodes completely absent; panicle sessile.....8. *M. siamensis* Warbg. ex Craib.

C. Panicle glabrous.

D. Panicle peduncled, erect, pyramidal.

E. Panicle much elongated (20-30 cm. or more), spreading.

- F. Leaves thin coriaceous, lanceolate or oblong-lanceolate; stam-
inodes with barren knoblike anthers, or toothlike; drupe ovoid,
gradually narrowed at the tip into a sharp curved beak. 9. *M. sylvatica* Roxb.
- FF. Leaves stiffly coriaceous, linear oblong, obtuse or subacute;
staminodes with unequal barren anthers; drupe ovoid,
4 cm. long, no curved beak. 10. *M. oblongifolia* Hook. f.
- E. Panicle 15-20 cm. long, laxly branched, contracted.
- F. Flowers small (2.5 mm. across), widely separated on 3-5 mm.
long pedicels; at the end of long slender branches; drupe, ovoid-
kidney shaped. 11. *M. minor* Bl.
- FF. Flowers big (4 mm. across), aggregated on 2 mm. long pedicels
at the end of short stout branches. 12. *M. zeylanica* Hook. f.
- D. Panicle sessile with fascicled branches at base.
- E. Panicle 5-10 cm. long, branches stout, erect; petals ovate-oblong,
3.5-4 mm. x 2-2.5 mm.; reticulations in the leaves fine, con-
spicuous. 13. *M. khasiana* Pierre
- EE. Panicle 10-15 cm. long, branches very slender; petals lanceolate,
2.5-3 mm. x 1 mm.; reticulations in the leaves obscure. 14. *M. gracilipes* Hook. f.
- AA. Petals 4 as well as 5 in flowers of the same panicle, with 3-5 ridges; stamen
1 fertile.
- B. Panicle peduncled, pyramidal, branches spreading; leaves oblong or
oblong-lanceolate, base cuneate.
- C. Petals oblong-lanceolate, ridges 4-5 branching from a broad central
base, 4-4.5 x 1.25 mm.; drupe ellipsoid, compressed like a thick bis-
cuit; seed reniform. 15. *M. campiosperma* Pierre
- CC. Petals elliptic-oblong, ridges 3 diverging from a short base, 3-3.5 x
1.5 mm.; drupe globose. 16. *M. Gedebe* Miq.
- B. Panicle sessile, branches many similar, fasciculate; leaves elliptic, base
rounded. 17. *M. microphylla* Griff. ex Hook. f.
- AAA. Petals 4 with 3-5 rarely 6-7 confluent ridges; stamens 1-2 fertile, rest
reduced to staminodes, or absent.
- B. Panicle pilose or pubescent.
- C. Panicle sessile; branches fascicled at base.
- D. Petiole 1.5-5.5 cm. long; petals 2 mm. long, with 3-5 ridges confluent
at base; flowers sub-sessile. 18. *M. Griffithii* Hook. f.
- DD. Petiole 6-1.8 cm. long; petals 4.5-5 mm. long with 3 closely adjacent
ridges, projecting above the surface; flowers sessile. 19. *M. sclerophylla* Hook. f.
- C. Panicle peduncled; branches pyramidal.
- D. Panicle 4-9 cm. long. 20. *M. Merrillii* nom. nov.
- DD. Panicle about 20 cm. or more in length.
- E. Leaves elliptic, base rounded; disc tri-lobed, entirely surrounding
the ovary. 21. *M. Beccarii* Ridl.
- EE. Leaves lanceolate or oblong-lanceolate; disc 4-lobed, surrounding
the base of the ovary.
- F. Leaves small; lamina 10-18 cm. x 3-5 cm.; drupe distinctly round,
9 cm. in diam.; bud-scales almost glabrous. 22. *M. similis* Bl.
- FF. Leaves big, lamina 16-25 cm. x 5-6.5 cm., drupe ellipsoid, 5.5-10
x 4-6.3 cm.
- G. Petiole 3-5 cm. long; leaves coriaceous ultimately decurrent
on short petiole; reticulation conspicuous beneath, obsolete
above; drupe slightly compressed, 5.5-8 cm. x 4-6 cm. 23. *M. altissima* Blanco
- GG. Petiole 1-3 cm. long; leaves very coriaceous, reticulations
prominent on both surfaces; drupe 10 cm. x 6.3 cm., strongly
concave on one side and convex on the other. 24. *M. Rumphii* Pierre
- BB. Panicle glabrous.
- C. Leaves elliptic, broad, shortly acuminate, stiffly coriaceous except in
M. philippinensis.
- D. Panicle sessile, branches fascicled at base, densely flowered; petals
elliptic, obtuse. 25. *M. philippinensis* sp. nov.

- DD. Panicle peduncled, erect, branches pyramidal spreading; petals lanceolate or oblong.
- E. Sepals sparsely ciliate at the margins; staminodes absent.....26. *M. Haylandi* Ridl.
- EE. Sepals glabrous; staminodes minute, teethlike.
- F. Petiole 1.5-2 cm. long, thick, grooved above; midrib flattened; petals with 3 ridges divergent from a thick base. 27. *M. rigida* Bl.
- FF. Petiole 2.5-5 cm. long, rounded and very thick; midrib much elevated beneath; petals with 5 ridges. 28. *M. Maingayi* Hook. f.
- CC. Leaves oblong, oblong-lanceolate, or obovate-oblong, obtuse or sub-acute.
- D. Panicle peduncled, branching from the very base.
- E. Petiole 4-12 cm. long; leaves much elongated (18-24 cm.); ultimate branchlets bearing 8-12 flowers.....29. *M. longipetiolata* King
- EE. Petiole 1-4 cm. long; leaves shorter (up to 20 cm.); ultimate branchlets bearing 3-6 flowers.
- F. Petals with 3 vertical ridges, closely adjacent, ending in wartlike excrescences projecting from the surfaces.
- G. Sepals glabrous; leaves oblong-lanceolate, petiole 2-4 cm. long, round; panicle with a number of branches at base.....30. *M. quadrifida* Jack
- GG. Sepals ciliate at the tip; leaves spathulate-oblong; petiole thick flattened, 0.5-1.5 cm. long; panicle with sub-corymbose branches.....31. *M. spathulaefolia* Bl.
- FF. Petals with 6-7 ridges, not ending in wartlike excrescence; panicle with pyramidal, spreading branches, none from base. 32. *M. timorensis* Bl.
- DD. Panicle sessile, with similar, fasciculate branches.
- E. Petals ovate, obtuse, 3 mm. long; leaves lanceolate acute or acuminate.....33. *M. monandra* Merr.
- EE. Petals ovate-lanceolate, acute, 4.75 mm. long; leaves broadly oblanceolate or obovate elliptic.....34. *M. andamanica* King

Section II. Disc narrow, often reduced to the form of a stalk to the ovary, rarely obsolete; petals free or adnate to the disk.

- A. Petals free from the disk; stamens 5-10, of which 1-5 are fertile.
- B. Panicle puberulous, reddish; leaves obovate-spathulate, up to 20 cm. in length; stamens 10, fertile 5.....35. *M. lagenifera* Griff.
- BB. Panicle glabrous; leaves linear-lanceolate, very narrow, 30 cm. or more in length; stamens 5, fertile 1.....36. *M. macrocarpa* Bl.
- AA. Petals adnate to or inserted on the disc; filaments dilated and connate at base; stamens 5, fertile 1.
- B. Panicle glabrous.
- C. Leaves thickly coriaceous, stiff, elliptic or obovate, rounded at apex, reticulations indistinct on both surfaces; flowers about 1 cm. long.....37. *M. foetida* Lour.
- CC. Leaves thinly coriaceous, oblong-lanceolate, shortly acuminate, reticulations prominent below; flowers about 0.7 cm. long.....38. *M. odorata* Griff.
- BB. Panicle tomentose or pubescent.
- C. Flowers 0.6 cm. long, pinkish purple; panicle 50-60 cm. long, laxly flowered; fruit oblong with gibbous base; leaves 17-20 cm. long.....39. *M. Kemanga* Bl.
- CC. Flowers 1 cm. long, pale lilac; panicle 30-40 cm. long, densely flowered, much branched; fruit obovate-oblong (19 cm. x 10 cm.), with a thick reddish epicarp; leaves 12-30 cm. long.....40. *M. caesia* Jack
- CCC. Flowers 2 cm. long, lilac; panicle 40-60 cm. long, densely flowered; leaves 25-40 cm. long.....41. *M. superba* Hook. f.

ENUMERATION OF SPECIES

1. *Disk tumid*, 5-4 lobed.*A. Petals* 5.*Stamens* 10-12.

1. MANGIFERA DUPERREANA Pierre Fl. For. Cochinch., t. 362 A (1897); Lecomte Flor. Indoch., 2, 14, fig. 4 (1908); Craib Fl. Siam. Enum., 1, 343 (1931).

Local Names.—Quéo (Annamite in Cochinchina).

A tree 30-40 m. high. *Leaves* oblong, slightly obovate, abruptly acuminate, obtuse or mucronate; limb rigid, slightly undulate; nerves 14-18 pairs, faint; reticulations very fine; lamina 13-20 cm. long; petiole 1-4.5 cm. long, much thickened at base, grooved above. *Panicle* tomentose with dark-grey hairs, 20-25 cm. long; branches at base 7-8 cm. long. *Flowers* closely aggregated, 4-6 merous; pedicels 1 mm. long, articulated. *Sepals* generally 5, elliptic, densely hairy outside, twice as long as bracts; 2.25 mm. x 1.75 mm. *Petals* 4-6, imbricate, 4-5 mm. x 1.5-1.75 mm.; ridges 3, glandular, very conspicuous, parallel meeting at centre. *Disc* papillate, wavy; lobes 10, 1 mm. high. *Stamens* 10-12; 5-6 fertile, staminodes in between the lobes of disc; filaments 2 mm. long. *Carpel* 1; ovule inserted laterally; style slightly longer than ovary. *Fruit* smaller than and inferior to common mango (*M. indica*); flesh white slightly acidic when young, with terebinthine taste.

According to Pierre this species is closely allied to *M. pentandra* Hook. f. and *M. caloneura* Kz. It can, however, be distinguished from both of them by the presence of 5-6 staminodes alternating with 5-6 fertile stamens, much more hairy sepals, by the petals having ridges, and by the smaller size of the flowers.

Type.—Pierre Nos. 2774 and 1651, from Isle of Phu-quoc, Cochinchina in Herb. Mus. Paris.

Distribution.—COCHINCHINA: Isle of Phu-quoc (*type*), Taynin, Thudau-mot, Bienhoa, Samrongtong. SIAM.

Economic uses.—Its fruits, though smaller than and inferior to common mango, are taken by the natives. The flesh is white and slightly acidic when young, and has a terebinthine taste.

The wood is greyish-white and is used for making oars of boats. The planks are mottled (Crevost & Lemarie Cat. Prod. Indoch., 1, 234, 1917).

Stamens 5, all fertile.

2. MANGIFERA PENTANDRA Hook. f. Fl. Brit. Ind., 2, 14 (1876); Engler DC. Mon. Phan., 4, 198 (1883); King in Journ. As. Soc. Beng., 472 (1896); Pierre Fl. For. Cochinch., t. 364 F (1897); Ridl. Fl. Mal. Penin. 1, 522 (1922).

Local names.—Mam ploni, Mampelam, Manga dodol, Pauh, Pauh Samar (Malay).

A tree 18-24 in. high. *Leaves* coriaceous, oblong or oblong-lanceolate, rounded or shortly acuminate, margins subundulate, base slightly cuneate or roundish; nerves 16-18 pairs, more elevated below, reticulations fine and very conspicuous on both surfaces; lamina 20 cm. x 7-8

cm., petiole 1.5–2 cm. long. *Panicle* terminal, spreading, tomentose, longer than leaves (about 30 cm. long); much branched, densely flowered. *Flowers* crowded, subsessile, cream-white. *Sepals* 5, ovate, obtuse, coarsely pubescent outside; 2.5–3 mm. x 1.5 mm. *Petals* 5, linear-oblong, about twice as long as sepals, yellowish-white; ridges, 6–7 yellow-brown, 3 reaching beyond the middle; 4–4.5 mm. x 2 mm. *Disc* swollen; lobes 5, fleshy. *Stamens* 5, all perfect; unequal, 2 mm. or less in length, inserted on the disc. *Carpel* 1; ovary globose smooth, style subterminal. *Fruit* "green, oblong, compressed" (Ridley); rather rough, of good taste.

This species is closely related to *M. caloneura* Kurz from which it differs by its longer (about 20 cm.) prominently reticulated leaves, 5 perfect stamens, petals with 6–7 ridges and the fruits.

Flowering.—February.

Sheets examined.—MALAY PENINSULA: Malacca, Griffith 1095 (*co-type*). (CAL). Kedah: Alor Sta, February, Collector 15235 (CAL). Alor Sta, March 1938, Yacob, "Local name Pauh Samar" (SING). Jitra, 11.7.36, Corner, "Local name Pauh, Common tree in villages of Kedah" (SING). Singapore: 1899, Ridley (SING). Pahang: Pekan, Dec. 1924, Burkill and Md. Haniff 17309. "Leaves of a *Mangifera* called "Pauh" which apparently grows better than the mango here. The mango is only in the villages in the lower part of the river. This has a round fruit, rather rough, of good taste; sterile now" (SING).

Type.—Griffith No. 1095 & Maingay No. 471 from Malacca in Herb. Kew, London.

Distribution.—MALAY PENINSULA: Malacca (*type*), Singapore, Kedah, Alor Sta in low land country and woods near the sea.

3. *MANGIFERA COCHINCHINENSIS* Engler in DC. Mon. Phan., 4, 205 (1883); Pierre Fl. For. Cochinch., t. 362 B (1897); Lecomte Flor. Indoch., 2, 15 (1908). *M. sugenda* Génibrel in Crevost and Lemarie Cat. Prod. Indoch., 1, 234 (1917).

Local Names.—Xoay Nut (Annam, Cochinchina).

Tree about 35 m. high. *Leaves* slightly coriaceous, obovate-oblong, obtuse, base cuneate; midrib stout, very prominent; lateral nerves 12–15 pairs; reticulations dense, prominent on both sides; lamina 8.5–15 cm. x 2.8–5.7 cm.; petiole 1.5–5 cm. long. *Panicle* densely pilose; about 20 cm. long; branches remote, subcorymbose at base, 3–6 cm. long. *Flowers* with pedicels 1.5–2 cm. long, articulated at base. *Sepals* 5, orbicular-ovate, pubescent outside, 2.5 mm. long. *Petals* 5, oblong; ridges 3–4 prominent, touching each other at the middle; 4 mm. long. *Disc* thick, glandular, 5-lobed. *Stamens* 5, all fertile; filament 2 mm. long. *Carpel* 1; ovary globose style short, central. *Drupe* 3.2 cm. long, 1.5–2.1 cm. in diam.; exocarp 3 mm., endocarp 1 mm. thick; integument membranaceous or coriaceous; radicle lateral.

Its leaves resemble very much *M. zeylanica* Hook. f., near which it was placed by Engler (1883), and its flowers are somewhat similar to *M. Duperreana* Pierre. Still, it is quite distinct from both of them by the floral characters.

Sheets examined.—COCHINCHINA: Saigon, Thudson, Feb. 1866, L. Pierre No. 1650 ex Herb. Mus. Paris. "Height 20–30 m.; drupe ovoid, yellow" (Bz).

Type.—COCHINCHINA: Thorel No. 1287 in Herb. Mus. Paris.

Distribution.—COCHINCHINA: Thu-dau-mot, Saigon; Cambodge; Mekong.

Economic importance.—"The wood of the sp. has similar uses as that of *M. indica*. Its fruits are liked by the natives though they are of very inferior quality" (Pierre).

Stamens 5, 3 fertile.

4. *MANGIFERA LANCEOLATA* Ridl. in Journ. Roy. As. Soc., S. Br., 59, 90 (1911); Fl. Mal. Penin., 1, 522 (1922).

Tree. *Leaves* coriaceous, lanceolate, obtuse, base narrowed; lateral nerves 12-13 pairs, 12.5 cm. x 3.75 cm.; petiole 2.5 cm. long, much thickened towards base from middle. *Panicle* terminal, 15 cm. long; branches at base 12.5 cm. long; rachis pubescent. *Flowers* 3 mm. long, white; pedicels as long. *Sepals* 5, ovate-lanceolate, pubescent. *Petals* 5, twice as long as sepals, linear-oblong; ridge 1, trifid at tip. *Stamens* 5, 3 fertile; staminodes 2. *Disc* fleshy, lobed. *Carpel* 1; ovary papillose. *Drupe* elliptic, about 3.75 cm. long (unripe).

No specimen seen, hence description copied from Ridley's Fl. Mal. Peninsula.

Type.—Ridley No. 15233 from Kedah, Alor Sta, in Herb. Kew, London.

Distribution.—MAL. PENINSULA: Kedah at Alor Sta, in open country (Ridley).

Stamens 5; 1-2 fertile.

Panicle tomentose, or puberulous.

5. *MANGIFERA INDICA* Linn. Sp. Plant., 200 (1753); Syst. Veg., 242 (1774); Burmann Fl. Ind., 62 (1768); Jacq. Icon. Rar., 2, t. 337 (1786-93); Lam. Encycl. Bot., 3, 696 (1789), Illustr., t. 138; Lour. Fl. Cochinch., 1, 160 (1790); Willd. Spec. Plant. 1 (2), 1150 (1797); Tussac. Ant., 2, t. 15 (1818); Roxb. Fl. Ind., ed. Carey & Wall., 2, 435 (1824); ed. Carey, 1, 641 (1832); DC. Prodr. 2, 63 (1825); Wight & Arnott, Prodr. Penin. Ind.-Or., 1, 170 (1834); Blanco Fl. Philip., ed. 1, 179 (1837); Blume Mus. Bot. Lugd. Bat., 1, 193 (1850); Miq. Fl. Ind. Bat., 1 (b), 628 (1859); Dalz. & Gibs. Bomb. Fl., 51 (1861); Marchand Des Terebin., 190 (1869); Brandis For. Fl. N.W. & C. India, 125 (1874); Hook. f. Fl. Brit. Ind., 2, 13 (1876); Kurz For. Fl. Brit. Burma, 1, 304 (1877); Engler in DC. Mon. Phan., 4, 198 (1883); Warburg in Engl. Bot. Jahrb., 13, 361 (1891); King in Journ. As. Soc. Beng., 65, 472 (1896); Pierre Fl. For. Cochinch., t. 361 (1897); Lecomte Flor. Indoch., 2, 18, fig. 4 (1908); Brandis Ind. Trees, 206 (1911); Matsumura Index Plant. Jap., 2, 312 (1912); Burns & Prayag, "Book of Mango," Bull. 103, Dept. Agric., Bombay (1920); Lauterb. in Engl. Bot. Jahrb., 56, 353 (1921); Ridley Fl. Mal. Penin., 1, 523 (1922); Merrill Enum. Philip. Fl. Plants, 2, 468 (1923); Craib Fl. Siam. Enum., 1, 344 (1931).—*Amba* or *Mangas* Bauhin Hist., 1, 173 (1650); *Mao* or *Mau* or *Mangas* Rheede Hort. Malabar., 4, t. 1 & 2 (1683); *Manga indica* Ray Hist. Plant., 1550 (1688); *Mangas domestica* Hermann Prodr., 351 (1689); *Mangifera*

arbor Hermann Mus. Zeyl., 59-66 (1717); Burmann Thes. Zeyl., 152 (1731); Linn. Fl. Zeyl., 211 (1747); *Manga domestica* Rumph. Herb. Amb., 1, 93, t. 25 (1741); Merrill Interptn. Rumph. Herb. Amb., 330 (1917); *Manga simiarum* Rumph. l. c., 1, 94; *Manga calappa* Rumph., l. c., 96; *Manga dodol* Rumph., in l. c., 96; *Mangifera Amba* Forsk. Descr. Plant. Fl. Aeg.-Arab., Cent. 8, 205 (1775); *M. domestica* Gaertn. Fruct., 2, 95, t. 100 (1791); *M. sativa* Roem. & Schult. Syst. Veg., 1, 37 (1817) in obs.; *M. indica* var. *parrie* Blume Bijdr., 1157 (1826); *M. montana* Heyne ex Wight & Arn. Prod. Penin. Ind.-Or., 170 (1834); *M. gladiata* Boj. Hort. Mauriti., 73 (1837); *M. viridis* Boj., l. c.; *M. racemosa* Boj., l. c.; *M. rubra* Boj., l. c., 76; *M. Linnaei* Korth. ex Hassk. Cat. Hort. Bog. Alt., 245 (1844); *M. anisodora* Blanco Fl. Philip., ed. 2, 129 (1845), ed. 3, 229 (1877); Merrill Sp. Blanco., 232 (1918); *M. rostrata* Blanco, l. c., ed. 3, 231, t. 62 (1877); *M. Kukula* Blume Mus. Bot. Lugd. Bat., 1, 192 (1850); *M. maritima* Lechaume Rev. Hortic., 369 (1870-71); *M. laurina* Blume Mus. Bot. Lugd. Bat., 1, 195 (1850); Engler in DC. Mon. Phan., 4, 202 (1883); Pierre Fl. For. Cochinch., t. 364 A (1897); *M. integrifolia* Gén. ex Crevost & Lemarié, Cat. Prod. Indoch. 1, 234 (1917).

Local names.—Amra (Sanskrit), Amba (Deccan), Am (Bengali), Mau and Mangas (Tamil), Amb (Hindi) (India); Ambe (Ceylon); Thayet, Thayet-pin, Tawthayet (Burma); Ma-muang, Mamong (Siam); Manga or Mangga, Mempelam, Pauh (Malay Penin.); Mamuang, Ampalam, Marampalam, Pelam (Sumatra); Manga or Manggah, Gadoeng, Golek, Kopjor, Gondo, Gongso, Wani, Madoe, Djanis Kote, Kates desa, Gajam poetih, Pelem (Java); Manga Kaja (Kangean Isl.); Paoeh (Soemba Isl.); Mangga (Malayan in British North Borneo); Manga, Manga Pau, Pau (Amboina); Bibi (New Guinea); Pao, Paho, Manga (Philippines); Xoai voi (Indochina); Suen to shu, Mong Kwo (China); Jap (Formosa).

A spreading tree 20-45 m. high; all parts glabrous except inflorescence. *Leaves* thinly coriaceous or membranaceous, variable in size and shape; oblong-lanceolate to oblong, acute or acuminate rarely subacute, margins undulate or straight, base cuneate rarely subcuneate; shining above; lamina 15-30 cm. x 3.5-6.5 cm.; petiole 1.5-6 cm. long, much longer in wild types than in the cultivated varieties. *Panicle* terminal, polygamous, densely flowered; minutely tomentose, pubescent or glabrescent; variable in length (generally 20-35 cm.), branches variable (6-15 cm.), spreading, pyramidal; bracteoles lanceolate, acute. *Flowers* yellowish or cream coloured, variable in size; pedicel articulated, 1.5-3 mm. long. *Sepals* 5, ovate-lanceolate, concave, pubescent outside, variable in size (1.5-3 mm. x 1.5-2 mm.). *Petals* 5, reflexed above the calyx, oblong to oblong-lanceolate, subacute; ridges not ending into tuberculate excrescences, variable in colour and pattern; size variable (generally 3-5 mm. x 1.5-2 mm.). *Disc* fleshy, 5-lobed; lobes distinct in male. *Stamens* 5; 1, rarely 2 or more fertile, the rest reduced to short filaments with sterile knoblike anthers. *Ovary* glabrous, obliquely ovoid; style subterminal almost as long as the fertile stamen. *Drupe* large, oblong or subreniform; flesh thick with sweet juice; very variable in size, shape and coloration of the epicarp in the different cultivated varieties; stone fibrous, very hard, the fibres are very long in the wild

types and inferior cultivated types; cotyledons two, rarely many, unequal.

Affinity.—*M. indica* is economically the most important species of the genus, as it bears one of the most delicious tropical fruits, the mangoes. It is closely related to *M. longipes* Griff., *M. sylvatica* Roxb., and *M. laurina* Bl. Blume, Miquel & Pierre regarded the latter as closely related to *M. indica*, although they maintained its separate status on the basis of distinctions in leaves, smaller flowers, and fruits. But on examining one of Blume's own sheets of *M. laurina* at the Sibpur Herbarium, I do not find much difference between the two species, and therefore suggest including *M. laurina* Bl. in *M. indica* Linn. This treatment is strongly supported by the fact that the collections of the species are very poorly represented in the Buitenzorg Herbarium in spite of the reported occurrence by Blume of 14 distinct varieties of *M. laurina* in Java. Had the species been distinct, the varieties would have been easily recognized and separated in the collections of the genus in the Herbarium. The varieties, mentioned under *M. laurina*, have possibly been confused with those of *M. indica*.

Varieties.—Mango has long been known and cultivated by the people of India and Malaysian countries. The varieties are innumerable as in the case of other ancient fruit trees and crop plants. They fall mainly under two categories—(1) the *seedling races*, and (2) the *cultivated grafted varieties*. The seedling races are not so well known in India, where about a thousand cultivated varieties occur. The classification and range of variability in the characters of the cultivated varieties have been discussed in a separate paper.

Type.—No "type" specimen is in the collections of the Linnean Herbarium. The species is based on Burmann's *Mangifera arbor*, described in *Thesaurus Zeylanicus* (1731). *M. arbor* Burmann was accepted by Linnaeus in *Fl. Zeyl.* (1747) and was subsequently changed to *M. indica* in *Species Plantarum* (1753). Burmann's work is based on Hermann's collections from Ceylon, included in his *Mus. Zeyl.* (1717). It appears therefore Hermann's description of *M. arbor*, amended later by Burmann, and Linnaeus is the basis of the species, *M. indica* Linn.

M. indica is the type species of *Mangifera* Linn., formally established in *Species Plantarum* as a monotypic genus.

Flowering takes place in different months in various parts of the world. In India, flowering is seasonal and occurs from December to March. The flowering season comes early in southern India starting in December, in Bengal it lasts from January to February, and in Bihar or U. P. it extends from February to March. In the Malay Peninsula, Java and other islands the flowering season starts earlier and extends from June to November. The main crop of the *fruit* is harvested between May and July, whereas the southern types can be harvested even in February and March; the Bengal types start ripening in April. The fruiting season in Florida is almost the same as in India, but it is earlier in Java.

Sheets examined.—INDIA (occurs wild almost throughout India near nullahs and small ravines in tropical and subtropical forests). N. W. India; ex Herb.

Royle (CAL). Punjab; Salt Range Base, 5 Aug. 1862, J. E. T. Aitchison 338 (Cult) (Dd). Rajputana; Mt. Aboo, Sept. G. King (CAL). Bombay; Khandala, 21 March 1903, G. A. Gammie 16133 (P). South India; Lower Pullneys, at 1500 ft. May, Rordiguez 2084 (CAL). Cuddapa Hills, 1881, R. H. Beddome (MH). Nilgiri Hills, Sigur Ghat, 17 March 1886, C. A. Lawson (MH). Central provinces; Betul, near the top of Kamala Hills, 2 Feb. 1891, J. F. Duthie 344, "apparently quite wild" (Dd). U. P.; Bhambar Gondar, 12 June 1916, Sis Ram 540 (Dd). Chota Nagpur; Ranchi, May 1875, J. J. Wood (CAL). Goelkera, April '47, Mukherjee. "Truly wild. By the side of small ravines & nullahs" (C. U.). Parashnath Hills (300 ft.), 9 April 1871, C. B. Clarke 14089 D "wild" (CAL). Bengal; Chittagong Hill Tracts, 1876, J. L. Lister (CAL). Rangamati Res., Feb. '46, Mukherjee; "truly wild type" (C. U.). Tipperah Hills, Agartala (800-1000 ft.), 26 Sept. 1914, Debbarman 50 (CAL). Sikkim; 3.3.57, Roxburgh. "Wild mango" (CAL). Assam; Nowgong, at 340 ft., 20 April 1914, U. N. Kanjilal 3842. Vern Thaiguju-phang (Cachar) (ASSAM); Khasi Hills, at 2-3000 ft. J. D. H. & T. T. ex Herb. Ind.-Or., Hook. fil. & Thomson (CAL). Manipur; Top of Kaboo valley, Kongal Thannah (800 ft.), 4 Jan. 1882, Watt 7237 (CAL). BURMA: Madoe Hills, 20 Feb. 1893, Dr. King's Collector 189 (CAL). Myitkyina, Kadu (850 ft.), 17.3.26 (MAY). Minhu; Dwechaung forests, 1 March 1939, C. E. Parinson 15743. "This is the true wild mango. Vern. Taw-thayet" (MAY). Insein: Myaungtaga, 9 March 1925, Parkinson 604 (CAL). Toungoo; Pynkum Reerve (400 ft.), 2 April 1914, C. G. Rogers 253 (Dd). Pegu; S. Kurz 2024, 2026. "Wild mango. no use" (CAL). Martaban; Kurz 164 ex Forester's Herb. (CAL). Tavoy; Ba Pe 808 ex Forester's Herb. (CAL.) ANDAMAN ISLANDS: South Andamans; 15.6.1890, R. L. Heinig (CAL). Chatham Isl.; Port Blair, Feb.-March 1934, Kiratram 3602 (Dd). SIAM: Bangkok, 1899, R. Zimmerman 90 (Bz) (CAL.) MALAY PENINSULA: Kelantan: Khota Bharu, 20 April 1839, E. J. H. Corner (SING). Trengganu; Khota Trengganu, 27 April 1937, Corner (SING). Perak; Bagan Serai, Feb. 1939, E. J. H. Berwick MK 67. "Saurabaya Mempelam" (SING). ANAMBA & NATUNA ISLAND (75 m.) III. 1928, Van Steenis 846 (Bz). SUMATRA: East coast, Asahan, Benoet, 1927, H. S. Yates 2645 (SING). SIMALOEER ISL.: 12.2.1919, Achmad 922 (representing *M. laurina* Bl.) JAVA: Blume ex Herb. Lugd. Bat. (representing *M. laurina* Bl.) (CAL). Batavia; Buitenzorg, 7 August 1902, Koorders No. 40098 B; Pasir Honje (350 M.), 11 Oct. 1927, R. C. Bakhuizen V/D Brink 7299. "Vern. Manggah sengir, Manggah pari (Soend); Bidaratjina (20-25 m.), Edelong. "Cult. Mangga dodol Bl." (Bz). Semarang; 23 & 25 Nov. 1930, Karta Nos. 213 & 291. "Vern. Gajem & Pelum Gande" (Bz) (SING). Djapara; Djoewana, Nagarengan, 4 June 1899, Koorders 35400B. "Cult." (Bz). Preanger; Tasikmalaja (700 m.), 25 July 1917, Koorders and Schumacher 47764 B. "Buah mangpelene" (Bz). Pekalongan; Margasari (100 m.), Sept. 1925, J. A. De Boer No. 33. "Pelem Kidang" (Bz). KANGAEAN ARCH.: Kangean, Desa Doeke, 12 Sept. 1919, Dommers 33, "Cult." (Bz). SOEMBA ISL.: Kananggar (700 m.), 21 May 1925, Isoet 569. "Vern. Paoeh, not cultivated." (Bz.) NEW GUINEA: I Oct. 1907, Pringgo 111. "Vern. Bibe" (Bz). AMBOINA: July-Nov. 1913, C. B. Robinson, *Plantae Rumph. Amb.* No. 123, representing *Pau Rumph.*? (Bz). Celebes: P. Wali, 1913, Rachmat 379 (Bz). BORNEO: Sarawak: Kapit, Upper Rejang river, 1929, J. & M. S. Clemens 21115. "Culta." (SAR). British North; Kudat plain, 29 April, 1933, Balajadia, For. Dept. No. 3070 "Cultivated. Local name Mangga (Mal.)." West Coast, 2 July 1932, Tolado, For. Dept. No. 1919. "Originally from Philippines so it is called Mangga manila" (Bz). PHILIPPINE ISLANDS: Balabac Isl. March-April, 1906, L. Mangubat, Bur. of Sci. No. 390 (Bz). Mindanao; Lake Lamas, Keithley, Feb. 1906, M. S. Clemens 255 (Bz). Negros; April 1908 Dumaquete, Philip. Isl. Plants No. 9759 (Bz). Mindoro; Calapan, 1 April 1903, Merrill 985 (Bz) (CAL). Luzon: Manila, April 1914, Merrill, Species Blancoanae No. 2 (Bz) (CAL). FRENCH INDOCHINA: Cochinchina, Saigon (cultivated) April 1871, L. Pierre 716 ex Herb. Pierre. "Vern. Xoai Coin" (Bz). CHINA: Yunnan Expedition, 1875, D. J. Anderson (CAL). Hainan: Pak Shik Ling, Ching Mai, Ku Tung, 7 March 1933, C. I. Lei 427. "Local names—Suen To Shu, Mong Kwo. Fairly common on moist gentle slope, sandy soil, meadow" (Bz). Kwantung: 23 April 1921, To Kang Ping 10615 (Bz). Fukien: Amoy, 7 April 1923, H. H. Chung 1466 (SING).

Distribution.—A native of the Indian Peninsula, mango (*M. indica*) is now distributed throughout the tropics of both hemispheres, and

extends to southern Florida, where it is cultivated on a large scale. It is now common in many parts of Latin America, having been introduced long ago. Whether it is truly wild in all these areas, is rather difficult to determine from the single fact that it occurs in forests. For it rapidly becomes naturalized and takes on the appearance of a wild plant, when introduced into regions where soil and climatic conditions are favorable for its growth.

The species occurs wild almost throughout India in the tropical and subtropical hilly forests, near nullahs and small ravines, at elevations up to 3,000 ft. It is present in the hills of western and eastern Ghats in South India, in the forests of Central India, and Eastern States Agency (Orissa), in Sahibgunge division and Chota Nagpur (Bihar), in the Himalayas, and in Assam and Chittagong Hill Tracts (near Burma border). It is also wild in Burma, Siam, Indochina, Malaya, Andamans and the Sunda Islands.

According to De Candolle (Origin of Cult. Plants, 1884) mango is undoubtedly a native of southern Asia or of the Malayan archipelago, because of the numerous varieties cultivated in these countries, and the number of available ancient names, including a Sanskrit name. Introduced long ago throughout the Indian Peninsula from its original home, the tree has since been extensively cultivated.

Its Malay names attest its exotic origin; *Mangga*, being the same word as the Tamil *Mangas*, is evidence for its early introduction from India. The stones are too large to be carried away by birds, but the frequency of its occurrence suggests dispersal by man.

De Candolle's argument and the history of introduction of the species in different areas suggest that the mangoes originated somewhere in Eastern India, Burma, Malay or Indochina, either simultaneously in different areas or in a single area, whence it was dispersed by man.

With the beginning of commerce between Asia and Europe mango was introduced in other parts of the world. The Portuguese are credited with introducing mango in Africa and later in Brazil, being the first to reach India, and trading in spices and other vegetable products of the East. As is most likely, early in the 16th century they carried mango, plants or seed, from Goa (India) to East Africa, and thence to West Africa and adjacent possessions, and finally across to Brazil. The origin of the genus and the history of introduction of the different species will be discussed in detail in a separate paper.

Economic uses.—FOOD: The first and most obvious use of ripe mango fruit is as a dessert. Chutneys, tarts, and jellies are made from the unripe fruits in India; these promote appetite. In Celebes part of the surplus mango crop is turned into vinegar. The manufacture of a kind of brandy is possible (Tropenpflanzer 2, 1898, p. 66). In India, the unripe fruit is often sliced and sundried for future use. In Java, ripe fruit juice is often sundried for future use; this is also done in India. Canning is now being done commercially in India. Mango flowers, which are produced in enormous quantities, are eaten by the Siamese (Kerr). Honey from mango flowers is said to be very thick and sugary (Journ. Board Agric. Brit. Guiana, 11, No. 2, 1918, p. 95). Very young purple-brown leaves are eaten by the Javanese with rice.

MEDICINAL.—In India the fruit has long been considered a valuable medicine by both Hindu and Muhammadan physicians. In *Bhaba-prakasa* a confection made of the juice of ripe fruit, sugar and aromatics is recommended as a restorative tonic. The blossom, kernel and bark are considered to be cold, dry and astringent, and are used in diarrhoea etc. The powdered seed has been recommended by Dr. Kirkpatrick as an anthelmintic in doses of 20–30 grains, and also as an astringent in bleeding piles and menorrhagia (Phar. of India, p. 59). Paludanus in his notes on Linschotan's Travels writes: "Being raw it is bitter of taste and is therefore good against worms and looseness of the belly; against worms when it is eaten raw, and against looseness of the belly when it is roasted." The medicinal use of the seeds is widespread, and seeds may be found dried and stored in the Chinese Pharmacies of the Straits. From the fruit just before ripening, a gummy and resinous substance exudes, which has the odor and consistency of turpentine, and from the bark a gum is obtained which is partly soluble in cold water. Ainslie says that the gumresin mixed with lime-juice or oil is used in scabies and cutaneous affections. The bark is astringent and used in Cambodia in hot lotions for rheumatism and leucorrhoea (Menaut, Bull. Econ. Indochine, 1929, p. 265).

DYE.—The bark and leaves yield a yellow dye. The dye from bark is used to turn green matting and cloth, already turned blue by the use of Indigo. From the bark, Wardle was able to dye cotton, silk, and wool a light more or less yellowish shade of brown, slate and drab (Watt Dict. Econ. Prod. Ind. 5, 146, 1891).

TIMBER.—A grey or greyish brown wood without any strong characteristic features. In old trees sometimes dark-brown with black streaks and hard; in younger trees coarse grained, soft; weight about 41 lbs. per c. ft. Pores scanty, moderate sized and large, distinctly marked on a longitudinal section, often subdivided and sometimes joined by short, concentric bands. Medullary rays fine, wavy, closely packed, interrupted by, or bent round, the pores. (Gamble Man. Ind. Timbers, p. 211, 1922). A very steady wood which retains its shape extremely well, when seasoned. Not very durable in exposed positions. It is liable to fungal staining and decay.

The wood of South Indian mango is of excellent quality as the plants produce long straight boles of good girth. It is nevertheless a wood which is extensively used in almost every part of the country. Its chief uses are for cheap furniture, planking, floor and ceiling boards, tea chests and other box and crate works, boat-building, agricultural implements, parts of carts, tonga hood frames, and recently for plywood manufacture. It is a good wood for dry cooerage and shoe heels (Trotter, The Common Commercial Timbers of India and their Uses, 129–30, 1941).

6. *MANGIFERA LONGIPES* Griff. Notul. 4, 419, (1854); Hook. f. Fl. Brit. Ind. 2, 15 (1876); Kurz For. Fl. Brit. Burma, 1, 303 (1877); Engler in DC. Mon. Phan. 4, 201 (1883); King in Journ. As. Soc. Beng. 65, 473 (1896); Pierre Fl. For. Cochinch., t. 365 A (1897); Ridl. Fl. Mal. Penin., 1, 523 (1922); Merrill Enum. Philip. Fl. Plants, 2, 468 (1923); Ridl. in 194 (1933).—*M. Parih* Miq. Fl. Ind. Bat. 1 (b), 630 (1859). *M. sumatrana* Miq. l. c. 631.

terminal or axillary; 30 cm. or more in length, stout, glabrous, blood-red when fresh, black when dry; branches stout, suberect; branchlets scattered, cymose with 4 or more flowers; bracteoles minute. *Flowers* deep-red, pink inside; 1 cm. long, 6 mm. across; pedicels thick, 1 mm. long. *Sepals* 5, thick, ovate-lanceolate, deeply concave, sub-acute, glabrous; 4 mm. x 2.5 mm. *Petals* 5, adnate to the disc, reflexed slightly above the calyx; linear-oblong, acute; ridge elongated, 3-fid confluent at base; 8-9 mm. x 2-2.5 mm. *Stamens* 5, connate at base with short torus; 1 perfect nearly as long as petals (8 mm.); rest shorter, unequal, with sterile knoblike anthers, nearly 5 mm. long. *Disc* very short, pedicel-like, adnate to the swollen base of filaments. *Ovary* sub-ovoid, glabrous; style slender subterminal, longer than fertile stamen. *Drupe* green, oval not compressed, apex oblique, with a very foetid smell; 8-10 cm. x 6 cm. x 4-6 cm.; exocarp thin, with whitish tomentum, dotted; mesocarp nearly 2 cm. thick, stringy. *Stone* thick, fibrous, hard, 2-edged like that of common mango, 7 cm. x 3-4 cm. Integument chartaceous, whitish (brown inside); cotyledons equal, closely pressed, oblique at base, each with an auricle incumbent on the apex of the radicle; radicle short, almost at right angles with the cotyledons; plumule conspicuous.

Examination of the material of this species from various herbaria disclosed two types of specimens. The second type differs from the first in having large, broadly elliptic leaves (44-50 cm. x 15-17 cm.), whereas the inflorescence and flowers are the same in both types. The broad leaved specimens are from Malaya (H. Kunstler No. 6051, E. J. H. Corner, and I. H. Burkill). The second type may be a race of *M. foetida* Lour.

The species is based on Loureiro's specimen from Cochinchina, found in cultivation, and partly on Rumphius' *Manga foetida*.

Flowering.—Almost throughout the year in different localities, but mainly in two flushes, once during December-March and again during May-July. *Fruits* mature during March-June and again in November.

Sheets examined.—MALAY PENINSULA: Malacca: Griffith 1099 (CAL); Maingay 472 (CAL). Gopong: In rocky jungles (500-800 ft.), May 1884, H. Kunstler 6051 (CAL) (SING). Perak: Father Scortechini 2064 ex Herb. Mus. Perak (CAL). Taiping, 9 July 1936, E. J. H. Corner (SING). Bagan Serai, Feb. 1939, Bereick 68 (SING). Singapore: Pulau Tekong, Oct. 1890, Ridley 1810 (CAL). Surong, 1893, Ridley 4776 (CAL). 1822, Wallich Catalogue 8488B (CAL). Bot. Garden, 17.8.36, Marzuki 31699 (SING) (Bz). Penang: March 1884, C. Curtis 1747. "Bachang. Cultivated" (CAL) (SING). Johore: Mawai-Jamaluang Road, 8.3.1938, E. J. H. Corner 34909 (Bz) (SING). Jadon Bay, 13 June 1934, Corner (SING). Pulau Tinggi, June 1915, Burkill (SING). Pahang: May 1922, Ridley (SING). BURMA: Tenasserim: Mergui, April 1911, Meebold 14921 (CAL). River side, 14 Jan. 1926, Parkinson 1601. "Local name Lamut. Cultivated tree, 40 ft. high looking much like an ordinary mango tree. Flowers purplish. Fruit eaten" (Db). SUMATRA: Palembang: 4 Dec. 1922, Dorst T-IP-760 (Bz). East coast: Kisarin, Asahan, Yates 2560 (Bz). West Coast: Ophir, Watas Panti (930 M.), 26.3.1924, Maharadjia No. 8 "Vern. Rangeh" (Bz). East Coast: Medan, May 1929, Ochse. "Batjang" (Bz). Sibolangit (500 m.): 12 Aug. 1921, Lorzang 8491 (Bz). JAVA: T. Horsfield ex Herb. T. Horsfield: representing *M. Horsfieldii* Miquel; Blume ex Herb. Lugd. Bat., representing *M. foetida* Lour. var. *sphaeroidea* Bl. (Bz). Kosaca Bauland (2000 ft.); Dec. 1897, Forbes 356 (CAL). Pandeglang: Sangiang, 2 April 1937, N. Burer 8. "Limoes" (Bz). Yapara: Soemanding (600 m.), 20 May 1936, Wageman 38. "Pakil" (Bz). Pekalongan (100 m.): 23 July 1922, C. Boot 3355 (Bz). Soebah, 1892, Koorders 11396B (Bz). Saltiga: 8 July 1909, Leenwen-Reijnsaan (Bz). Djakdja: Goenoeng Kidoel, 23 Sept. 1928, Ochse. "Pakil" (Bz). Bogor: Kota Batoe, De Monchy. "Ambatjang" (Bz). Batavia: Pal

Merah (20 m.), 15 May 1904, Backer 32274. "Cultivated" (Bz). Buitenzorg (250 m.), 24 Nov. 1924, Bakhuizen V/D Bring 3523. "Cultivated. Batjang & Limoes" (Bz). Ragoenan, Pasan Minggoe, 24 Nov. 1926, J. J. Ochse. "Batjang" (Bz). Ngarengan: Djaewana, Djapara, 22 May 1897, May-June 1899. S. H. Koorders Nos. 32961 B, 35124 B, 35570 B. "Cultivated. (Bz). Pasoeroean: Toeren and Kependjen, 26 June 1896, Koorders 23728 B. "Pakil" (Bz). Noesa-kambang: Tjilatjap, Banjoemas (50 m.), 6 Dec. and 8 Dec. 1891, Koorders 409 B & 411 B. "Cultivated. Batjang, Limoes, and Pakil" (Bz). Preanger: Soeka-boemi, Palaboeauratoe, 17 May 1890, 23 April 1893, 23 March 1899, Koorders Nos. 388 B, 12286 B, and 34241 B (Bz). Wanaradja, Pangentjongan, 19 July 1893, Koorders 13910 B (Bz). Tasikmalaja (720 m.), 1 Aug. 1917, Koorders 47761 B (Bz). Sanggrawa: Djampangkoelon, 5 July 1890, Koorders 389 B (Bz). BORNEO: Sarawak, Kapit, Upper Rejang River, J. & M. S. Clemens 21096 (Bz). West Koetei, Boekit-La jang, Nov.-Dec. 1931. "Alim Pajang" (Bz). East Koetei, Bengalon Rapak, Bengalon, 27.4.31, A. Hamid 18. "Asampajang" (Bz); Takat, 3.6.28, Hamid 24 (Bz); Beneden-Matan, Klampai, 22.8.30, C. C. 14392. "Hembawang" (Bz). North Borneo: Kabili Sepilok, Hilly tract, 24.2.37, Mendosa 4603. CELEBES: Malili, Kawata (350 m.), 27 Sept. 1932, Waturandang 47. "Mangga hoetan." AMBOINA: July-Nov. 1913, C. B. Robinson, *Plantae Rumphianae Amboinenses* No. 126: representing *Manga foetida* Rumph. (Bz).

Distribution.—BURMA: Tenasserim (cult.). MALAY PENINSULA: Penang, Singapore, Malacca. COCHINCHINA: Tonkin (*type*). SIAM. JAVA. SUMATRA. BORNEO (Sarawak). AMBOINA (*Manga foetida* Rumph.). Western NEW GUINEA. CELEBES.

Economic value.—Burkill in Dict. of Econ. Prod. of Mal. Penin. **2**, 1402, (1935), writes: "A considerable tree, cultivated and encouraged in a semi-wild state throughout Malaysia, and so encouraged as to be one of the commonest of its genus in Malay. There are races of it but they have never been identified."

FOOD.—"The fruits when immature are quite inedible, but are much eaten when ripe, in which state they are still green; their flavour is coarse, their smell objectionable, but the flesh is rather sweet. They are chiefly used in curries and are pickled by salting. Sometimes they are made into sweetmeats."

MEDICINAL.—The resinous sap in the stem has an irritant action on the skin. It is recommended in the Medical Book of Malayan Medicine (Gard. Bull. S. S. **6**, 1930, p. 352) in the form of a lotion made from the bark for treating an ulcer. It is the same irritant sap which makes the fruit quite inedible, and if the fruit-flesh is applied to the skin before it is ripe, it produces an inflammation. Intestinal troubles result from injudicious eating of the fruit.

TATTOOING.—The same juice is used to deepen tattoo scars (Evans in Journ. F. M. S. Mus. **9**, 1920, pp. 22).

TIMBER.—The timber is yellowish or pale grey in colour, with coarse fiber and not durable. If used it should be for temporary articles, and article kept away from damp and rain. Moll and Jansonnus (Mikrogr. d. Holzes Java, **2**, 1908, p. 467) have described its minute structure.

38. *MANGIFERA ODORATA* Griff. Notul., **4**, 417 (1854); Fl. Brit. Ind., **2**, 17 (1876); Engler in DC. Mon. Phan., **4**, 210 (1883); King in Journ. As. Soc. Beng., **65**, pt. 2, 474 (1896); Crevost and Lem. Cat. Prod. Indochine, **1**, 235 (1917); Ridley Fl. Mal. Penin., **1**, 524 (1922); Merrill Enum. Philip. Fl. Plants, **2**, 468 (1923); Ridley in Kew Bull., 194

(1933).—*M. foetida* Lour. var. *odorata* Pierre Fl. For. Cochinch., t. 365 B (1897). *M. foetida* Lour. var. *cochinchinensis* Pierre, l. c., t. 365 E. *M. foetida* Lour. var. *Kawinii* Blume in Pierre l. c., t. 365 F.

Local names.—Koeene, Kohini, Kwini (Malaya); Kibembem, Kwini, Kuwini, Kwene (Java); Bimbe, Bembem, Kawini (Sudanese); Ambachang, Embachang, Kuwini (Sumatra); Huani, Kandope (Philippines); xoai huong (Indochina).

Tree nearly 30 m. tall. *Leaves* coriaceous, oblong or elliptic-lanceolate, shortly acuminate; reticulations fine on both surfaces especially lower; lateral nerves about 20 pairs, very prominent beneath; lamina 15–30 cm. x 5–10 cm., subundulate at margins; petiole 3–6 cm. long. *Panicle* dark green, longer than leaves, stout, glabrous or shortly puberulous. *Flowers* odorous, flesh-coloured; about 7 mm. long, 5 mm. in diam.; pedicel slender, 2 mm. long. *Sepals* 5, red, ovate-lanceolate, acute, hyaline at the margins, 3 mm. x 1.5 mm. *Petals* 5, greenish, suffused with blood-red, adnate to disc at base; oblong-lanceolate, cordate at base; reflexed from middle; ridge elevated at base, branching upwards into 3 short arms reaching up to middle; 6 mm. x 2 mm. *Stamens* 5; 1 rarely 2 fertile (about 5 mm. long), rest reduced to short subulate structures (2–3 mm. long) with knoblike barren anthers at tip; filaments blood-red, swollen, connate at base with the short disc; anthers purple-lilac. *Disc* short. *Ovary* glabrous, globose; style sublateral, almost as long as petals. *Drupe* oblong with a beak below the apex, 10 cm. x 5–6 cm. “with a very bad odour, yellowish green with yellow spots and a central disc of reddish colour. Flesh yellow, not unpleasantly scented, not turpentinous, very fibrous, sweet and plentiful, so that culture might make this a good fruit. Stone very much compressed, covered with torn fibres, rather thick, lined with a parchment-like substance with oblong white markings. Seed compressed, very sub-reniform; cotyledons rugose, equal at base, one over-lapping at the top” (Griffith).

Var. *PUBESCENS* Engler in DC. Mon. Phan., 4. 210 (1883). Panicle and calyx shortly pilose.

Griffith observed the close affinity of the species with “Bachang” (*M. foetida* Lour.), but separated it from the former because of differences in leaf, fruit and seed characters. Hooker also supported the separation of the two species, and put forward further corroborative evidence, e. g., “petals free from the disc” in *M. odorata* and “adnate” in *M. foetida*. Engler (1883) accepted the same view. But examination of liquid and herbarium material shows that the flowers of both species have petals adnate or inserted at the base of the disc. It is likely that, on the basis of this character, Pierre (1897) reduced *M. odorata* Griff. to varietal status under *M. foetida* Lour. In spite of such resemblances, I feel that the two species should be kept separate, due to the differences in leaves, size of flowers, and in fruit and seed.

M. foetida Lour. var. *Kawinii* Blume, which was reduced by Pierre to *M. foetida* Lour., has been transferred to *M. odorata* Griff., the local name of which is *Kwinii*, whereas the local name for *M. foetida* is *Bachang*. These local names of wild and semiwild mangoes are fixed and therefore justify the transfer of var. *Kawinii* to *M. odorata*.

Flowering.—Almost throughout the year from February to October.

Fruiting.—Mainly during October.

Sheets examined.—MALAY PENINSULA: Singapore: Bukit Timah, 1893, Ridley 4773. "Kwini" (CAL.); Irwell Bank Rd. 26 June 1936, Corner 30799 (Bz) (SING); Kelantan State: Kota Bahru, 20 April 1937, Corner (SING); Perak: Bagan Serai, Krain, Feb. 1939, E. J. H. Berwick No. K 60 (SING). SUMATRA: Medan, May 1929, Ochse (Bz). JAVA: Batavia: Buitenzorg (250 m.), 6 April 1925, J. J. Ochse. "Cultivated; Local name Kemang (Sund.)" (Bz); Bidaratjina, Edeling. "*M. foetida* Lour. Var. Kwini" (Bz); Ragoenan, Pasar Minggoe, 5 Oct. 1926, Ochse. Djokdja: Goenoeng Kidoel, 23 Sept. 1928, Ochse (Bz). Pekalongan: Margasari (100 m.), 11 Sept. 1923, Tokkinga (Bz). Soebah 8.10.1891, Koorders 11383 B (*M. foetida* Lour. var. *Kawini* Miq.) (Bz). Boschdistrikt (125 m.), June 1920, A. C. Noltee. "Palem Koewini" (Bz); No. 407 H. B. ex Herb. Hort. Bot. Bogor (cultivated in Hort. Bogor. Local name Mangga Kawini), representing *Mangifera indica* L. var. *Kawini*=*M. odorata* (Bz). CELEBES ISLAND: 1913, Rachmat 364. (Bz). PHILIPPINES: Mindanao, 1901-1902, Capt. G. P. Ahern, Herb. Ahernianum No. 6589 (Bz).

Type.—MALACCA: Griffith No. 1098 in Herb. Kew, London.

Distribution.—MALAY PENINSULA: orchards of Malacca and Singapore (*type*), Perak, Kelantan, etc. JAVA. SUMATRA. CELEBES ISLAND. PHILIPPINES. BRITISH NORTH BORNEO. COCHINCHINA.

It is widely cultivated in the Malay Peninsula, Java, Philippines and French Indochina for its fruits.

Economic importance.—The young fruit is inedible like that of *M. foetida*. When ripe, the fruits are sweet, juicy, and edible, with a distinctive flavor. They are distinguished from fruits of *M. foetida* by their flavor and yellow color. The fruits are poor eating as the flesh is traversed by coarse fibres. The Malays use them also in curries, and make pickles from them with salt. However, the tree is cultivated for its fruits throughout Malaysia because a superior mango cannot be grown satisfactorily, owing to climate.

In the Medical Book of Malayan Medicine (Gard. Bull. S. S. 6, 1930, p. 334), the bark is recommended for external application in Hystero-epilepsy in the form of a compound cosmetic-like mixture. The sap in the bark is irritant.

Moll and Janssonius (Mikrogr. d. Holzes Java, 2, 1908, p. 460) remark that the wood is microscopically very similar to that of *M. indica* (Burkill).

B. Panicle tomentose

39. MANGIFERA KEMANGA Blume Mus. Bot. Lugd. Bat., 1, 202 (1850); Miq. Fl. Ind. Bat., 1 (b), 634 (1859); Hook. f. in Trans. Linn. Soc., 23, 167 (1862), t. 23; King. in Journ. As. Soc. Beng., 65, 477 (1896); Pierre Fl. For. Cochinch., t. 364 N (1897); Ridl. Fl. Mal. Penin., 1, 525 (1922). Burkill Dict. Econ. Prod. Mal. Penin., 2, 1406 (1935).—*M. foetida* Bl. Bijdr., 1153 (1826), non Lour. *Manga foetida II* (Wani) Rumph. Herb. Amb., 1, 99 (1741); Merrill Interptn. Rumph. Herb. Amb., 330 (1917). *M. polycarpa* Griff. Not., 4, 416 (1854) t. 167, fig. 2; Hook. f. Fl. Brit. Ind., 1, 20 (1876); Engler in DC. Mon. Phan., 4, 213 (1883).

Local names.—Kemang, Camang (Malaya); Wani (Bali).

A big tree, 24 m. high. Leaves coriaceous, ovate-oblong, subacute or shortly and obtusely acuminate, narrowed to sessile flat base, grooved

above; nerves 20–30 pairs, more prominent below, 5–6 mm. apart, almost parallel, arched; reticulations faint on both surfaces; lamina 17–20 cm. x 6.5–7 cm. *Panicle* 30–75 cm. long, lax; peduncle erect stout, angled, covered by minute white hairs; with a rosette of triangular, acute, tomentose, spiral bracts at base; primary branches slender, nearly 18 cm. long; secondary branches 3–3.5 cm. long, from upper half of primary ones; tertiary about 1 cm. long; flowers densely clustered at apices of tertiary branches (all above measurements including flowers). *Flowers* subsessile, 6 mm. long, pinkish-purple; pedicels short, 1–2 mm. long. *Sepals* 5, erect, ovate, pubescent on back, 2.5 mm. x 1 mm. *Petals* 5, linear-lanceolate, acute, with 1 median ridge; attached to base of the pedicel-like disc; 4.5–5 mm. x 1 mm. *Stamens* 5, free; 1 fertile, shorter or as long as petals; staminodes very minute. *Ovary* globose; style lateral, longer than the petals. *Drupe* oblong, obliquely emarginate near apex; flesh white, juicy; stone lanceolate, not woody, abundantly fibrous; seed erect.

M. Kemanga was established by Blume, on his earlier species *M. foetida*, found under cultivation in Java, where it was known as *Kemanga*. Engler (1883), Pierre (1897), and Merrill (1923) reduced it to *M. caesia* Jack, due to its close affinity with the latter species, while King (1897) and Ridley (1922) maintained its separate status. Burkill (1935) confirmed its separation from *M. caesia* Jack and stated that the tree can be "recognised at any time by means of difference in the leaves and inflorescences."

Examination of the material obtained from different herbaria disclosed the following distinctions which justify its retention as a separate species.

M. CAESIA Jack	M. KEMANGA Blume
<i>Leaves</i> shortly petiolate, lateral nerves at intervals of 8–10 mm.	<i>Leaves</i> sessile, shorter; lateral nerves closer, at intervals of 5–6 mm.
<i>Panicle</i> 30–40 cm. long; peduncle and branches stout, tawny-tomentose.	<i>Panicle</i> 50–60 cm. or more long; peduncle erect, angular, slender covered with minute white hairs, less branched; tertiary branches above lower-half of secondary branches.
<i>Flowers</i> 1 cm. long.	<i>Flowers</i> 6 mm. long, less in number; pedicels shorter (1–2 mm.).
<i>Drupe</i> obovate-oblong, very big (18–19 cm.), base rounded; exocarp tomentose, dirty grey; stone elliptic.	<i>Drupe</i> oblong, base gibbous; stone lanceolate (Ridley).

I followed King in reducing *M. polycarpa* Griff. to this species. The vernacular name of *M. polycarpa* is "Camang" in Malacca, but in the archipelago it is Kemang, Komang or Kamanga.

Sheets examined.—MALAY PENINSULA: Malacca, Griffith. "Camang: a distinct species" (CAL). SUMATRA: at 500 ft., 1881, H. O. Forbes 3198 (CAL). JAVA: Blume ex Herb. Hort. Bot. Bog. (Bz); ex Herb. Hort. Bog. (cult.) (Bz).

Distribution.—In orchards and villages of SINGAPORE and MALACCA; islands of the MALAYAN ARCHIPELAGO.

Economic uses.—Its fruit is brown and juicy with a strong smell. It is used in curries for its sour flavor. The timber is pinkish in color, turning brown with age and is apparently a somewhat better wood than that of *M. caesia*, being more compact and firmer. The resin is acrid and injurious to the skin of wood cutters (Ridley Agric. Bull. Straits and F. M. S., 1, 107, 1901).

40. MANGIFERA CAESIA Jack in Roxb. Fl. Ind., ed. Carey and Wall., 2, 441 (1824); Cal. Journ. Nat. Hist., 4, 174 (1843); Walp. Ann. Bot. Syst., 1, 200 (1848-49); Griff. Not. 4, 415 (1854); Marchand Des Terebin., 191 (1869); Hook. f. Fl. Brit. Ind., 2, 19 (1876); Engler in DC. Mon. Phan. 4, 213 (1883); King in Journ. As. Soc. Beng., 65, pt. 2, 478 (1896); Pierre Fl. For. Cochinch., t. 364 M (1897); Merrill in Journ. Roy. As. Soc., S. Br., No. 66, 349 (1921); Ridl. Fl. Mal. Penin., 1, 525 (1922); Merrill Enum. Philip. Fl. Plants, 2, 468 (1923).

Local names.—Binjai (Malay); Bauno, Baluno (Philippines); Beluno, Ondo (British North Borneo); Wani (Bali); Bingloe or Kemang-Binglow, Kemang (Java); Medang-kemang, Kemang Hadji (Sumatra).

A stately magnificent, very handsome and showy *tree* when in flower, 30 m. or more in height; branches stout, rough from cicatrices of leaves. *Leaves* whorled at apex, subverticillate acyclic lower below; thickly coriaceous; obovate-oblong, shortly and obtusely acuminate, attenuated at base; nerves 25-35 pairs at intervals of 8-10 mm., thin, straight except near margin; midrib stout, flattened; reticulations obscure; lamina 12-30 cm. x 5.5-9 cm., decurrent on 1-2 cm. long petiole. *Panicle* having a crown of conspicuous, triangular acute, tomentose, spiral bracts at base; erect, minutely tawny-tomentose, glaucous reddish, 30-40 cm. long; primary branches nearly 15 cm. long; secondary opposite or sub-opposite rarely alternate, variable in length (up to 6 cm.), tertiary about 1 cm. long (all above measurements including flowers); pedicels stout, tomentose, about 5 mm. long. *Flowers* pale lilac, 1 cm. long; bracteole broad, elliptic, 2 mm. long, densely pubescent outside; polygamous, male much more numerous than hermaphrodite, the latter when present terminal on each cyme. *Sepals* 5, lanceolate, subacute, erect, pubescent, 2.5-3 mm. x 1 mm., beautiful lilac inside except the margin. *Petals* 5, adnate to disc, linear, ridge one very conspicuous; margins usually inrolled; 8 mm. x 1 mm. *Stamens* 5, 1 fertile shorter than petal, anther small; staminodes very minute. *Disc* minute, stipitate. *Ovary* one-celled obliquely ovoid; style subterminal, longer than petals. *Drupe* edible (a popular fruit of the natives), obovate-oblong; 18-19 cm. x 9-10 cm.; right shoulder bulged above, slightly broader towards base; epicarp thick, reddish white, mesocarp fleshy; endocarp comparatively thin, coarsely fibrous; stone elliptic 7-7.5 cm. x 3.5 cm.; with a protruded stalk at base; cotyledons 2, elliptic, 1.5 cm. thick, almost filling up the cavity of the stone,

smooth; radicle adjacent to one side of the cotyledon; integument brown, coriaceous.

Var. *verticillata* (C. B. Rob.) Mukherji, stat. nov.—*M. verticillata* C. B. Robinson in Philip. Journ. Sci., 6, 337 (1911); Elmer Leaflet. Philip. Bot., 2381 (1914); Merrill Enum. Philip. Fl. Plants, 2, 468 (1923), in part.

Leaves in whorls of 4, elliptic-ovate to obovate; lamina 12–15 cm. x 4.5–6 cm. towards apex; petiole distinct, flattened, 2.5–3 cm. long. *Panicle* with strongly 4 angled branches and branchlets, verticillate or subverticillate in fours. *Sepals* oblong to ovate, 1.5–2 mm. long, puberulous. *Drupe* yellowish, oblong, cylindrically round, 10 cm. x 6.5 cm.

Specimens seen.—PHILIPPINES: Mindanao, Agusan, Cabadbaran (Mt. Urdanets), July 1912, Philip. Isl. Plants No. 13258 (CAL). BRITISH NORTH BORNEO: Papar, 27.32, Telado, For. Dept. No. 1931 "Beluno, Bundo" (Bz).

M. caesia was based on a collection of Jack from Sumatra, perhaps at Bencoolen, in the year 1820. Jack regarded the species as "very remarkable" and named it "caesia" probably because of the bright, attractive color of the panicle. Jack sent the description of the species to Wallich who inserted it in the revised edition of Roxb. Fl. Indica (1824).

M. verticillata C. B. Robinson was reduced by Merrill (Enum. Philip. Fl. Plants) to *M. caesia* Jack most likely because of the similarity in floral structure. I have compared the Philippine specimen named *M. verticillata* with a large number of specimens of *M. caesia* from different localities, and found that its verticillate leaves and inflorescence branches were quite distinct. Whorled leaves are not found in any other species of the genus, but characteristic of the genus *Bouea*. As whorled leaves are a distinct character of Robinson's species, I consider it necessary to treat it as a variety of *M. caesia* Jack.

Flowering.—September to November and June. *Fruiting*.—Mainly in February.

Sheets examined.—MALAY PENINSULA: Malacca: Griffith 1100 (CAL); Malaya: Maingay 465 ex Herb. of Late A. C. Maingay (CAL); Bruang, July 1883, J. S. Goodenough 1381 (SING); Feb. 1936, E. J. H. Corner. "Local name Binjai" (SING); Perak: Father Scortechini 187 and 189 ex Herb. Mus. Perak (CAL) (SING). Singapore: Holland Rd. 1892, H. N. Ridley (SING); Market, 4 July 1938, E. J. H. Corner (SING); Bot. Garden, March 1918, Md. Noor 1832 (cult.) (SING). SUMATRA: Palembang; Lematangitir, G. Megang (75 m.), 24 Nov. 1923, L. F. W. Dorst No. T 1004 "Kemang Hadji" (Bz); Banjoeasin, 12 Jan. 1916, W. Grashoff 905 (Bz); Lematang Deloe (110 m.), 1916, W. Grashoff 905 (Bz); Lampong; Menggala, 27 Nov. 1913, H. A. Gusdorf 28 (Bz); Bengkoelen: 22 July 1916, E. Jacobson. "Kemang" (Bz); Bengkalis: 1920, Beguim 405 (Bz). JAVA: Blume ex Herb. Hort. Bog. (CAL); Batavia, Buitenzorg, 20 Dec. 1895, S. H. Koorders. (Bz); Batavia, 30.10.1902, 12.9.1913, Koorders 37597 and 42212 "Cult." (Bz). Baringkok (250 m.), Feb. 18, 1924, R. C. Bakhuizen V/D Brink 6300. "Wild; local name Kemang" (Bz); Pasir Honje (300 m.), 10 Feb. 1924, R. C. Bakhuizen V/D Brink. 6282 "Cultivated; local name Bingloe or Kemang-Bingloe" (Bz). Djasinga 20 Nov. 1913, Backer 10097 (Bz). Bogor, 1900 Soegandiredja 29 (Bz); Tjijakoe, 17 Nov. 1924, Ochse. "Cult.; Kemang" (Bz); Bantam, Rangkas Bitong, 9 June 1911, Backer 1092 "Cult." (Bz). Prianger, Tasikmalaja, 2 Aug. 1917, Koorders 47763 (Bz). BALI: Nigara (40 m.), 2.9.18. R. Mair Sarip 199. "Local name

Wani" (Bz). BRITISH NORTH BORNEO: Mt. Kinabalu, Tuaran, Margin of paddy field, 27 June 1932, J. & M. S. Clemens 27743. "Tree 90 to 100 ft. high; flowers lavender, purple inside; fruit edible" (SING); Papar (cultivated), 2.7.32, Telado, For. Dept. No. 1931. "Fruit edible" (Bz); Mempakul, Kg. Bundu, Plain, 11.6.32, Goklin, For. Dept. No. 2293 (Bz); Bangney island, July to Sept. 1923, P. Castro and F. Melegrito 1693 (Bz); Pladjoe 3 June 1912, Amdjah 100 (Bz); Tawao, Elphinstone province, Elmer 21602 (Bz). BORNEO: Tarakan, Dec. 1935 (Bz); West Koetu, 18 Dec. 1931, G. H. Hinar 351 (Bz). PHILIPPINES: Tabuc, Basilan, Aug. 1918, A. Samonte, Forestry Bur. No. 27261 (Bz).

Distribution.—JAVA (cult.). BORNEO. PHILIPPINES (cult.). SUMATRA (type). BALI. MALAY PENINSULA: Malacca (cult.), Perak, Singapore.

Economic uses.—Cultivated in Singapore, Sumatra, Java, etc., for its edible fruits, though they are inferior in quality to those of *Mangifera indica*. The flesh is stringy. Malayanese are fond of the fruit, but the smell is certainly very objectionable.

The young leaves and seeds may be eaten (K. Heyne, Nutt. Plant. Ned. Ind. p. 966, 1927; Ochse, Vegetables Dutch E. Ind., p. 39, 1931). The leaves are not cooked, but used for flavoring other food, where in season young fruits would be employed (Burkill Dict. Econ. Prod. Mal. Penin., 2, p. 1402, 1935).

When available the timber is said to be used for boards in the Dutch Indies. Ridley describes it as light red, marbled with yellow, with distinct rings (Agric. Bull. Straits and F. M. S., 1, p. 524, 1922).

41. *MANGIFERA SUPERBA* Hook. f. Fl. Brit. Ind., 2, 19 (1876); Engler in DC. Mon. Phan., 2, 214 (1883); King in Journ. As. Soc. Beng., 65, 478 (1896); Pierre Fl. For. Cochinch., t. 365 D (1897); Ridl. Fl. Mal. Penin., 1, 525 (1922).

Local name.—Beechee (Singapore).

A very large tree; branches terminating into a crown of lanceolate, pubescent, 8 mm. long scales. *Leaves* large, stiff, very thickly coriaceous, cuneate-oblancoate, acute; margins slightly undulate, gradually narrowed from the upper third to the short flattened stout petiole; midrib very stout, flattened on upper, raised on lower surface; lateral nerves about 30 pairs; reticulations obscure; lamina 20–36 cm. x 6–9.5 cm. *Panicle* terminal, much longer than leaves (50–60 cm.), tawny-pubescent; peduncle very stout, with many lanceolate woody bracts at base; primary branches sub-erect with short branchlets crowded near apex; flowers densely crowded at apex of branchlets; bracts numerous, large, broadly lanceolate, pubescent. *Flowers* about 2 cm. long, lilac; pedicels very short. *Sepals* 5, ovate-lanceolate, concave, russet-ferruginous at back, 11 mm. x 5 mm. *Petals* 5, nearly twice as long, adnate to the cylindric torus; lanceolate, acuminate, recurved; ridge single, thick; 2 cm. x 4 mm. *Disc* slender, pedicel-like. *Stamens* 5; 1 with perfect anther, others with imperfect small anthers; filaments subequal. *Ovary* obliquely ovoid; style slender, subterminal, elongated, longer than stamens; ovule laterally attached, horizontal. *Drupe* "ellipsoid or oblong, 9.5 cm. x 5 cm.; flesh green or whitish, acidic" (Pierre's description from an unripe fruit).

The species is based on Maingay's collections from Malacca. The plant is very conspicuous in having the biggest flower and inflorescence

among the *Mangiferas*, and possessing a large crown of bracts at the base of the peduncle. It is curious that no one but Maingay should have met with so conspicuous a tree. The only other record of its presence was made by Pierre from localities near Singapore where he found it cultivated under the name of Beechee.

Sheets examined.—MALAYA: Malacca: Maingay No. 476 (*co-type*) (CAL); Johore, S. Bekok, 8.5.1938, Corner 34969 (SING).

Type.—Maingay No. 476, 1499 from Malacca in Herb. Kew, London.

Distribution.—MALACCA (*type*). SINGAPORE (cultivated).

SPECIES DUBIAE

1. *MANGIFERA LANGONG* Miq. Fl. Ind. Bat., Suppl. 1, 521 (1860); Engler in DC. Mon. Phan., 4, 215 (1883).

Local name.—Langong (Malayan).

Tree, branches angular. *Leaves* chartaceous, oblong-lanceolate to lanceolate, shortly apiculate, base acute or sub-cuneate; nerves about 30 pairs, close; reticulations more prominent beneath; lamina 17–32 cm. x 5–9 cm.; petiole semi-round, slender, 1.25–5 cm. long. *Flowers* unknown. *Drupe* subglobose, compressed.

Miquel considered it to be allied to *M. Taipan* Miq. In the absence of any flowering specimen in the collections, the species is here included as doubtful.

Sheets examined.—WEST SUMATRA: Rau, Diepenhorst No. 2333 H. B. "Vern. Langong (Malayan)" (*co-type*) (Bz); Medan, May 1929, J. J. Ochse. "Cultivated. Vern. Asam Koembang" (Bz); Priaman, Diepenhorst No. 2333 ex Herb. Sulp. Kurz. "Langong" (CAL).

Type.—Diepenhorst No. 2333 from Rau, West Sumatra in Herb. Utrecht.

Distribution.—SUMATRA.

2. *MANGIFERA LAXIFLORA* Desr. in Lam. Encycl., 3, 697 (1789): DC. Prodr., 2, 63 (1825).

A tree looking like *M. indica*. *Leaves* subsessile, ovate-lanceolate. *Panicle* much elongated, lax. *Flowers* imperfectly known. *Calyx* divided; lobes obtuse. *Androeceum* pentandrous. *Drupe* ovate, subrotundate, small.

The author of the species regarded it as closely related to *M. indica* Linn., but differing in the longer lax panicle, pentandrous flowers with obtuse, divided calyx, and the smaller globose fruits.

However, the species appears to me to be closely allied to *M. pentandra* Hook. f., with which it may have to be merged. In the absence of any material the matter could not be decided.

Type.—Martin and Stadman's specimen from the Isle of France in Herb. Roepert.

Distribution.—MAURITIUS: Isle of France (*type*).

3. *MANGIFERA MUCRONULATA* Blume Mus. Bot. Lugd. Bat., 1, 201 (1850); Miq. Fl. Ind. Bat., 1 (b), 633 (1859); Engler in DC. Mon. Phan., 4, 215 (1853).

Tree 10–13 m. high; branches distinctly angular. *Leaves* subcoriaceous, lucid above, elliptic to elliptic oblong, mucronate, attenuated at base; reticulations obsolete on both surfaces; lamina 13–18 cm. x 6–8 cm.; petiole 2.5 cm. long. *Flower and fruit* unknown.

According to Miquel and Engler it is closely allied to *M. rigida* Blume, differing mainly in the thinner leaves. No specimen could be secured by me.

Type.—Zippelius' specimen from New Guinea in Herb. Ultraject.

Distribution.—NEW GUINEA.

4. *MANGIFERA PARVIFOLIA* Boerlage and Koorders in Koord.—Schum. Syst. Verz., 2, 5. Abt. (Lief. 2), 31 (1910).

Local names.—Sekekia, Membatjang hoetan, Mempelán hera (Sumatra). Rawa, Aris (Borneo).

Tree 20 m. high; branches slender trichotomous dormant buds round, scaly; ultimate branches 2 mm. thick. *Leaves* alternate, aggregated at apex; thickly coriaceous, shining on both sides, elliptic, base acute, apex sharply acuminate; nerves 8–10 pairs, obsolete; 7–9 cm. x 2.25–4 cm.; petiole semi-round, grooved above, 1–2 cm. long. *Flower* unknown. *Drupe* elliptic, 4 cm. x 2.8 cm., at the end of a stout elongated peduncle.

The following remarks of the authors of the species will show the doubtful status of the species: "Though the material is insufficient yet it can be said to approach much nearer the genus *Mangifera*. It is distinct by its small leaves and branches. The leaves look somewhat like *Bouea burmanica* Griff., but differ from the latter in being alternate instead of being opposite" (Note on type sheet). The fruit has been described by me.

Sheets examined.—Central SUMATRA: 27.3.91. Koorders 21218 B (*co-type*) (Bz). East Sumatra: Bengkalis, Isir Koemboeng (3 m.), 3.11.26 (Bz). Selatpandjang, Kampar Monding (5 m.), 9 March 1937, M. Sewandono 31 (Bz). WEST BORNEO: Simpang, Djenoe, 17.8–28 (Bz); Mempawah, 13.5.30 (Bz).

Type.—Koorders 21218 B from Central Sumatra.

Distribution.—Central and eastern SUMATRA (*type*); WEST BORNEO.

5. *MANGIFERA REBA* Pierre Fl. For. Cochinch., t. 363 B (1897); Lecomte Fl. Indoch., 2, 19 (1908); Crevost and Lema Cat. Prod. Indoch., 1, 234 (1917); Burkill Dict. Econ. Prod. Mal. Penin., 2, 1401 (1935).

Local names.—Svai reba, Svai meas (Cambodia); Xoai som (valley of Dongnai, Cochinchina).

Tree 35 m. high; branches angular when young. *Leaves* oblong-lanceolate, acute or obtuse at base, shortly acuminate at apex, tip blunt or mucronate, subcoriaceous, rigid, shining above; nerves 18–22 pairs, very fine, slightly more prominent above; reticulations prominent on both faces; lamina 12–16 cm. x 3–5 cm.; petiole semi-round, 1–2.5 cm. long. *Inflorescence* fructiferous, terminal, 20 cm. or more long; clothed with dense, short, grey hairs; branches 6–9 cm. long. *Flowers* unknown. *Fruit* curved near apex, compressed, blunt at tip, atten-

uated at base when young. Stone elliptic, rounded at apex, fibrous; ribbed with raised, stout nerves; 8 cm. x 7.8 cm. x 3.8 cm.; integuments thin, dark-brown.

Pierre described the species from fruiting specimens of a tree found in a single locality. He was doubtful about its position, as the flowers were not known. As no flowering specimens have since been collected, it is here included as doubtful. I was unable to secure any material of this species.

Pierre found that the leaves and especially the stones of this sp. are very distinct. This tree resembles considerably *M. campptosperma* Pierre in its raised nerves on the stone and the erect inflorescence branches, but differs from the latter species in the shape of the endocarp. The stem contains resin canals both in the bast and in the pith, a character common also to some other species of the genus. Its limb is one-third less in diameter than that of *M. foetida* and *M. indica*, and two-thirds less than that of *M. Kemanga*. Its affinity with *M. indica* is supported by the nature of the epidermis and the reduced or crushed hypodermis. *M. Kemanga* Bl. differs in having a single continuous layer of sclerenchymatous cells below the epidermis.

Type.—Pierre No. 1648 from valley of Dongnai, Annam, in Herb. Mus. Paris, France.

Distribution.—FRENCH INDOCHINA: Annam, Valley of Dongnai (*type*).

Economic uses.—Its fruits are harvested by the natives. The wood is almost as useful as that of *M. indica* (Pierre, Crevost & Lemarie).

6. *MANGIFERA TAIPA* Buch.—Ham., in Mem. Wern. Soc., 5, 326 (1826).—*Manga sylvestris altera* Rumph. Herb. Amb., 1, 97 (1741); Merrill Interptn. Rumph. Herb. Amb., 331 (1917). *Mangifera membranacea* Bl. Mus. Bot. Lugd. Bat., 1, 195 (1850); Engler in DC. Mon. Phan., 4, 215, (1883). *Mangifera Taipan* Ham. ex Miq. Fl. Ind. Bat., 1 (b), 631 (1859).

Local names.—Taipa, Way Way, Ouw (Amboina).

Tree with more lofty and straight trunk than *M. indica*. *Leaves* sparse, membranaceous, oblong-lanceolate, shortly and obtusely acuminate or sub-acute, base cuneate; nerves prominent on both sides; reticulations obsolete; lamina 12.5–35 cm. x 4–10 cm.; petiole 2.5–5 cm. *Panicle* lax, terminal. *Fruit* pilose.

This species is based wholly on Rumphius' description and is very doubtful. The correct epithet for the species should be *Taipa* as originally designated by Hamilton, and not Miquel's *Taipan*.

Blume referred part of this species to *M. membranacea* Bl. but Hamilton's name, being older, should be maintained, if future investigation shows the species to be distinct.

Distribution.—MOLUCCA. NEW GUINEA.

7. *MANGIFERA UTANA* Buch.—Ham., in Mem. Wern. Soc., 5, 326 (1826); Miq. Fl. Ind. Bat., 1 (b), 634 (1859).—*Manga sylvestris prima* Rumph. Herb. Amb., 1, 97, t. 27 (1741); Merrill Interptn. Rumph.

Herb. Amb., 330 (1917). *Mangifera glauca* Blume Bijdr., 1158 (1826); Mus. Bot. Lugd. Bat., **1**, 201 (1850); Engler in DC. Mon. Phan., **4**, 214 (1883).

Local name.—Manga utan.

Leaves chartaceous, glaucescent beneath, elliptic-oblong, attenuated at both ends. *Panicle* terminal, spreading, shorter than leaves. *Flowers* unknown. *Fruit* glabrous.

Rumphius' figure and description are the basis of this species. Blume (1850) referred part of *M. Utana* to *M. glauca*. Engler (1883) accepted Blume's treatment, but Miquel (1859) reduced *M. glauca* Bl. to this species. In accordance with the International Rules of Botanical Nomenclature, I accept Miquel's treatment of *M. glauca* as a synonym of this species.

M. Utana is of doubtful status as it is apparently not very different from *Manga domestica* Rumph. (*M. indica*).

Flowering.—July.

Distribution.—MOLUCCA ISLAND.

8. *MANGIFERA XYLOCARPA* Lauterb. in Engl. Bot. Jahrb., **56**, 354 (1921).

Tree 25 m. high; branches round, 5–10 mm. thick; bark greyish brown. *Leaves* lanceolate, coriaceous, shining above, shortly acuminate, base cuneate, margins entire sub-revolute; lateral nerves 11–12 pairs; reticulations prominent beneath; lamina 17–30 cm. x 6–8 cm.; petiole 8–15 mm. long. *Panicle* axillary, laxly flowered. *Flowers* unknown. *Drupe* ovoid, compressed, slightly oblique near apex, lively rosy; 6.5 cm. x 5 cm. x 3.5 cm.; flesh thin, not fibrous; endocarp nearly 10 mm. thick, corky towards the middle, not fibrous; stone 4 x 2 cm., ruminated outside; embryo ovoid-oblong, compressed.

The affinity of this species is doubtful. To date it has been distinguished only by the glabrous endocarp. (Lauterb). No specimen seen by me.

Type.—Lederman No. 10757 from New Guinea in Herb. Mus. Berolinense.

Distribution.—North-East NEW GUINEA, from Malu as far as Sepik, in secondary woods at 20–40 m. altitude.

Economic uses.—The fruit is harvested by the natives (Lauterb.).

NOMINA NUDA

1. *M. balba* Gen. ex Crevost & Lemarie, Cat. Prod. Indoch. **1**, 235 (1917).
2. *M. equina* Gen. ex Crevost & Lem., l. c., **1**, 235.
3. *M. Gandaria* Roxb. Hort. Beng., 18 (1814).
4. *M. oryza* Gen. ex Crevost & Lem., l. c., **1**, 235.

SPECIES EXCLUDENDAE

1. *M. africana* Oliver, Fl. Trop. Afr., **1**, 443 (1869).
I follow Engler in excluding this species from *Mangifera* in view of its meagre description and unusual distribution for the genus.
2. *M. amba* Forsk. Fl. Aegypt. Arab., 205 (1775) = *M. indica* L.
3. *M. anisodora* Blanco, Fl. Philip., ed. 2, 129 (1845) = *M. India* L.
4. *M. arbor* Hermann, Mus. Zeyl., 59 (1717) = *M. indica* L.
5. *M. axillaris* Desr. in Lam. Encyc., **3**, 697 (1788) = *Buchanania Lanzan* Spreng.
6. *M. Curtisii* Heyne Nutt. Pl. Ned.-Ind., **3**, 126 (1917) = *Melanorrhæa Curtisii* Oliver.
7. *M. domestica* Gaertn. Fruct., **2**, 95, t. 100 (1791) = *M. indica* L.
8. *M. foetida* Blume Bijdr., 1153 (1826) = *M. Kemanga* Blume.
9. *M. foetida* Griff. Notul., **4**, 419 (1854) = *M. foetida* Lour.
10. *M. foetida* Lour. var. *odorata*, *cochinchinensis* and *Kawinii* Pierre Fl. For. Cochinch., t. 365 B, E, and F (1897) = *M. odorata* Griff.
11. *M. fragrans* Maingay Mss. in Hook. f. Fl. Brit. Ind., **2**, 18 (1876) = *M. macrocarpa* Blume.
12. *M. gabonensis* Aubry-Le Comte ex O'Rorke in Journ. Pharm. et Chim., sér. 3, **31**, 275 (1857) = *Irvingia Barteri* Hook. f.
13. *M. gladiata* Boj. Hort. Maurit., **73** (1837) = *M. indica* L.
14. *M. glauca* Rottb. in Nye Saml. Danske Vidensk. Selsk. Skr. **2**, 534, t. 4, fig. 1 (1783) = *Elaeodendron glaucum* Pers.
15. *M. glauca* Spanoghe in Linnaea, **15**, 188 (1841) = *M. timorensis* Blume.
16. *M. glauca* Blume Bijdr. 1158 (1826) = *M. Uiana* Buch.-Ham.
17. *M. Horsfieldii* Miq. Fl. Ind. Bat. **1** (b), 632 (1859) = *M. foetida* Lour.
18. *M. indica* Blume Bijdr., 1157 (1826) = *M. foetida* Lour.
19. *M. indica* Thw. Enum. Pl. Zeyl. 75 (1858) = *M. zeylanica* Hook. f.
20. *M. indica* Wall. Cat. 8487 I (1828) = *M. sylvatica* Roxb.
21. *M. integrifolia* Gén. ex Crevost & Lem. Cat. Prod. Indoch. **1**, 234 (1917) = *M. indica* L.
22. *M. Kukula* Blume Mus. Bot. Lugd. Bat., **1**, 192 (1850) = *M. indica* L.
23. *M. laurina* Blume Mus. Bot. Lugd. Bat., **1**, 195 (1850) = *M. indica* L.
24. *M. Leschenaultii* March. Des Terebinth. 189 (1869) = *M. foetida* Lour.
25. *M. Linnaei* Korth. ex Hassk. Cat. Hort. Bog. Alt., 245 (1844) = *M. indica* L.
26. *M. mariana* Buch.-Ham. in Mem. Wern. Soc., **5**, 326 (1826) = *Bouea burmanica* Griff.
27. *M. maritima* Lechaume in Rev. Hortic. 369 (1870-71) = *M. indica* L.
28. *M. membranacea* Blume Mus. Bot. Lugd. Bat., **1**, 195 (1850) = *M. Taipa* Buch.-Ham.
29. *M. montana* Heyne ex Wight & Arn. Prod., 170 (1834) = *M. indica* L.
30. *M. oppositifolia* Roxb. Hort. Beng., 18 (1814) = *Bouea burmanica* Griff.
31. *M. Parii* Miq. Fl. Ind. Bat., **1** (b) 630 (1859) = *M. longipes* Griff.
32. *M. Parkinsonii* Fischer in Kew Bull., 84 (1927). This is a *Swintonia*, most probably *S. floribunda* Griff.
33. *M. parvifolia* Merrill in Philip. Jour. Sci., **20**, 401 (1922) = *M. Merrillii* nom. nov.
34. *M. pinnata* Desr. in Lam. Encycl. **3**, 697 (1788) = *Sorindeia madagascariensis* DC.
35. *M. pinnata* Linn. f., Suppl. 156 (1781) = *Spondias mangifera* Willd.
36. *M. polycarpa* Griff. Notul., **4**, 416 t. 167, f. 2 (1854) = *M. Kemanga* Blume.
37. *M. racemosa* Boj. Hort. Maurit. 73 (1837) = *M. indica* L.
38. *M. racemosa* Lam. Illustr., **2**, 113 (1793) = *Holigarna Arnottiana* Hook. f.
39. *M. rostrata* Blanco Fl. Philip., ed. 2, 129 (1845) = *M. indica* L.
40. *M. rubra* Boj. Hort. Maurit. 76 (1837) = *M. indica* L.
41. *M. sativa* Roem. & Schult. Syst., **1**, 37 in obs. (1817) = *M. indica* L.
42. *M. silvestris* König ex Roxb. Fl. Ind., ed. Carey, **2**, 385 (1832) = *Buchanania latifolia* Roxb.
43. *M. sugenda* Gén. ex Crevost & Lem., l. c. 234 (1917) = *M. cochinchinensis* Engl.
44. *M. sumatrana* Miq. Fl. Ind. Bat., **1** (b) 630 (1859) = *M. longipes* Griff.
45. *M. Taipan* Ham. ex Miq. l. c., 631 (1859) = *M. Taipa* Buch.-Ham.
46. *M. verticillata* C. B. Robinson in Philip. Journ. Sci., **6**, 337 (1911) = *M. caesia* Jack var. *verticillata* stat. nov.
47. *M. viridis* Boj. Hort. Maurit. 73 (1837) = *M. indica* L.

SUMMARY

Mango, a member of the genus *Mangifera*, has long been known by the people of India. De Candolle is of the opinion that mango

has been under cultivation for over 4,000 years. It is mentioned freely in early Sanskrit literature, and in the travel notes of foreigners who visited India between the seventh and sixteenth century A. D.

The cultivated varieties of Indian mango, the finest in the world, are the product of a determined drive to improve the fruit by the Muhammedan Emperors in India during the 16th century.

Carolus Clusius (1605) was the first botanist to write about mango. Hermann (1670-77) learned about it in Ceylon, where he collected a large number of plants. Linnaeus subsequently examined Hermann's specimens and published his *Flora Zeylanica* (1747) in which he included the mango tree, as *Mangifera arbor*, the name taken from Hermann's list. The specific name was subsequently changed to *Mangifera indica*, when the genus was established by Linnaeus (1753) on that single species. No specimen has been preserved as the type of the species on which the genus *Mangifera* is based.

Since the establishment of the genus by Linnaeus, the number of valid species has increased to 65 according to the list given in "Index Kewensis," due to the discovery of plants from different areas mainly by Roxburgh, Blume, Griffith, Hooker, King, Pierre and Merrill.

The first revision of the genus by Marchand (1869) dealt with only 11 species. It was studied by Engler (1883) who recognized 28 valid species and 4 doubtful ones.

The present paper deals with all species critically examined on the basis of the sheets obtained from all important Asiatic herbaria. Drawings of floral structures of all species previously not illustrated were made. Most descriptions were revised and amended, and the others completed. The treatment of each species includes full literature references, synonymy, local names, distribution, type, flowering and fruiting time, economic uses, and a list of herbarium specimens on which the analysis is based. A key for identifying all species has been prepared.

The number of species recognized as valid in this paper is 41, whereas 8 species are regarded as doubtful, 4 names are "nomina nuda," and 47 names have been excluded from the list of valid species as synonyms of some other species of *Mangifera* or of other genera. One new species, three new varieties, one new name and one transfer to new status are proposed.

The pre- and post-Linnean history of the genus is recorded in the introduction. A chart has been prepared showing the geographical distribution of the species.

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*Names set in italics indicate synonyms, names of sections, and pre-Linnean names for *Mangifera*.

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This species is closely allied to *M. monandra* Merr., from which it can be distinguished by smaller leaves and flowers, and the pubescent inflorescences.

Sheets examined.—PHILIPPINES: Luzon, Zambales province, Masinloc, May 1903, Merrill 2946 (*Co-type*) (PHILIP). Mindanao, Lanai, Kolambugari, March 1916, F. Curz, For. Bur. No. 25497 "used locally for miscellaneous house construction" (PHILIP).

Type.—Merrill 2946 from Luzon, Zambales, Masinloc in Philip. Nat. Herb.

Distribution.—Philippine Islands.

21. *MANGIFERA BECCARII* Ridl. in Kew Bull., 194 (1933).

Leaves elliptic, obtuse cuspidate, glabrous, coriaceous, base rounded; 7–10 cm. x 3–5 cm.; nerves 11 pairs, elevated underneath; petiole thick, 1 cm. long. *Panicle* terminal, puberulous, lax, 22 cm. long. *Flowers* aggregated; pedicels 2 mm. long, pubescent. *Sepals* 4, lanceolate, pubescent. *Petals* 4, white, linear, glabrous, 1 mm. long. *Stamen* 1 fertile. *Disc* trilobed; lobes rounded, alternating with petals. *Ovary* with style as long as petals.

"This is closely allied to *M. Griffithii* but differs in the leaf-base being rounded, not cuneate, in the stronger elevated nerves and midrib, in the long spreading panicle branches, and in the 3-lobed disc entirely surrounding the ovary" (Ridley). No material being available, the description is taken from Ridley's.

Type specimen.—Beccari 3079 from Borneo, Sarawak, in Herb. Kew, London.

Distribution.—Borneo, Sarawak (*type*).

22. *MANGIFERA SIMILIS* Blume Mus. Bot. Lugd. Bat., 1, 200 (1850); Miq. Fl. Ind. Bat., 1 (b), 633 (1859); Engler in DC. Mon. Phan., 4, 207 (1883).

Local names.—Tais or Tajas (Sumatra).

A *tree* 30–35 m. high; branches angular, dark-red when young; dormant buds at branch tips with glabrous bud-scales. *Leaves* oblong or elliptic-lanceolate, coriaceous, cuneate at base, acute at apex; lateral nerves 16–18 pairs, more prominent below; reticulations prominent below, obsolete above; lamina 10–18 cm. x 3–5 cm.; petiole slender, 1.5–4 cm. long. *Panicle* surrounded by a crown of scales at the base when just emerging; terminal, laxly flowered, much-branched, sparsely pubescent; primary axis 23–28 cm. long, secondary branches about 10–15 cm. long, the tertiary branches 1–1.5 cm. long. *Flowers* polygamous; 4, 5 or more at end of ultimate branches, pedicels 2 mm. long. *Sepals* 4, ovate, obtuse, 2–2.25 mm. x 1.5 mm. *Petals* 4; ovate-oblong in hermaphrodite, elliptic-lanceolate in male; hyaline, obtuse at apex, reflexed below tip; ridges 5, orange colored, 3 in middle closely adjacent or coalescing, ending in tuberculate excrescences at tip beyond centre, 2 on the sides separate; 4 mm. x 1.5–2 mm. *Disc* fleshy, 4-lobed; lobes thick, distinct, warty. *Stamens* 4, 1 fertile with 3 mm. long filament; others reduced to short teeth-like projections, attached in pairs to inner side of the disc-lobes. *Ovary* globose, glabrous; style

subterminal, shorter than fertile stamen. *Drupe* distinctly round in outline, 9 cm. or more in diam. when mature; skin smooth, thick, dotted; mesocarp about 2.4 cm. thick, fibrous; stone 5 cm. with many long thin fibers.

Although Blume established the species, he was doubtful about its separate status, and considered the possibility of its being a variety of *M. spathulaefolia*, an allied species. The latter was subsequently reduced by Engler (1883) to varietal rank under *M. quadrifida* Jack. But *M. similis* differs from both species in the puberulous panicle, glabrous sepals, hyaline petals with 5 ridges, and globose fruit. It should therefore be retained as a separate species.

Flowering.—February.

Sheets examined.—SUMATRA: Palembang, Lematang-ilir, G. Megang (75 m.), Feb. 1922, C. F. V/D Zwaan (Bz). Banjoeasin, Bajoenglintjir (15 m.) Feb. 1919, F. H. Endert No. 51 E-IP-553 (Bz). Feb. 1919, F. H. Endert No. 51E-IP-607, 608 and 609.

Type.—JAVA: Blume's specimen in Herb. Lugd. Bat.

Distribution.—JAVA (*type*). SUMATRA.

23. MANGIFERA ALTISSIMA Blanco Fl. Philip., ed. 1, 181 (1837); ed. 2, 129 (1845); ed. 3, 230 (1877); Blume Mus. Bot. Lugd. Bat., 1, 199 (1850); Miq. Fl. Ind. Bat., 1 (b), 632 (1859); Marchand Des Terebin., 191 (1869); Engler in DC. Mon. Phan., 4, 214 (1883); Pierre Fl. For. Cochinch., t. 364 E (1897); Merrill, Govt. Lab. Bur. Bull. Philip., 17, 27 (1904); l. c., 27, 35 (1905), Philip. Journ. Sci. 1, (1906), Suppl., 84; Sp. Blancoanae, 232 (1918); Enum. Philip. Fl. Plants, 2, 467 (1923). *Buchanania reticulata* Elmer Leaflets Philip. Bot., 4, p. 1499 (1912).

Local names.—Pajo or Pahutan=Pajo (mango) and utan (wild) (Philippines).

Tree; branches angular when young, leaf-scars prominent; bud-scales prominent, velvety. *Leaves* coriaceous, oblong-lanceolate, darker green above, tip obtuse, base subcuneate; midrib very conspicuous at base; lateral nerves about 15 pairs, relatively faint; reticulations obsolete above, quite conspicuous beneath; lamina 20–25 cm. x 5–6 cm.; petiole subterete or compressed, 3–5 cm. long. *Panicle* terminal as also axillary, sessile; branches 3–4, fascicled at base and subtended by a crown of velvety scales, briefly tawny-pubescent, 10–25 cm. long. *Flowers* white or creamy white, in groups of 4–5 on secondary branches; pedicel slender, not exceeding 5 mm.; bracts tomentose, sharply acuminate. *Sepals* 4, greenish, deeply spoon-shaped, acute, glabrous, imbricate, 1.5–2.5 mm. long, persistent in fruit. *Petals* 4, free, white, ovate-oblong, glabrous 3–5 mm. long; ridges closely adjacent, with glandular thickenings at apex. *Stamens* 4; 1 fertile, inserted at the base of a thickened 4-lobed disc; rest very much reduced; filament 1.5 mm. long, glabrous; anther subelliptic. *Ovary* glabrous, slightly oblique; style subterminal, 2 mm. long. *Drupe* smooth, green or somewhat yellow when ripe, ovoid or ellipsoid, slightly compressed, 5.5–8 cm. x 4–6 cm.; exocarp fleshy, rather firm, white; mesocarp not at all stringy; frequently the point of insertion of the style persists in ripened fruit as a small protuberance below the apex.

This species is closely related to *M. quadrifida* Jack but is distinct in having velvety bud-scales, less coriaceous slightly bigger leaves with veins prominent below, glabrous sepals persistent in fruit, and slightly smaller fruits.

No "type" of this species exists in the collections as Blanco "did not permanently preserve any botanical material. Most of his descriptions were based on fresh material collected by himself or brought to him by other persons." *Exsiccatae* were later prepared by Merrill, who collected specimens in the Philippines; to a large degree these took the place of Blanco's "types," which were never preserved.

Sheets examined.—PHILIPPINES: Luzon: Bataan, Lamao river, April 1904, T. E. Borden, For. Bur. Nos. 642, 643, 830 (Bz) (SING). Rizal province, January to March, 1905, Ahern's Collector, For. Bur. No. 2442 (Bz) (SING). Rizal, Angat, Dec. 1914, Merrill: *Sp. Blancoanae* No. 831 (CAL). Tayabas province, Kinatakutan, January 1920, M. Oro, For. Bur. No. 30800 (SING). Zambale, January 1907, H. M. Curran, For. Bur. No. 5840 (Bz). Sibuyan island: Capiz, Mt. Giting-Giting, April 1910, Philip. Isl. Plants No. 12334 (named as *Buchanania reticulata*) (Bz) (CAL).

Flowering.—Twice, January to April and October to November.

Distribution.—PHILIPPINES: Angat, Rizal, Luzon. It is widely distributed in the northern and central parts of the archipelago at low and median altitudes; a sylvan species.

Economic uses.—Unripe fruits are pickled for future use; timber is locally used but not of a very good quality (Burkill, l. c. 2, 1401).

24. *MANGIFERA RUMPHII* Pierre Fl. For. Cochinch., t. 364 E (1897); Merrill Interptn. Rumph. Herb. Amb., 331 (1917); K. Heyne, Nutt. Plant Ned. Ind., 969 (1927).—*Manga sylvestris* V. M. Pau Rumph. Herb. Amb., 1, 96, t. 26 (1741). *Pauw* Rumph. Herb. Amb. 7, 18, t. 11 (1755).

Local name.—Pauh (Malayan).

Tree very tall, branches stout. *Leaves* elliptic-oblong, obtuse at apex, acute at base; very coriaceous; nerves 16–18 pairs, thin, rather elevated; reticulations fine, prominent on both surfaces; lamina 16–24 cm. x 6.5 cm., petiole 1–3 cm. long. *Panicle* 25 cm. or more long, branches at base 8–10 cm. *Flowers* 4–5 merous, small; hardly pedicellate in young flowers, which alone are known. *Sepals* 4, oval, concave, *Petals* (from bud) elliptic, 1.5 mm. x 1–1.25 mm.; ridges 3, glandular, hardly free at tip. *Disc* fleshy; lobes small, emarginate, round. *Stamens* 2; 1 fertile, rest absent. *Ovary* not known. *Drupe* 10 cm. x 6.3 cm., subelliptic, strongly concave on one side and convex on the other; flesh thick, without terebinthine flavor; stone less fibrous than that of *M. indica* Linn.

The species is based on specimens from Banda. Merrill referred the three Rumphian forms, *Pauw I, II & III*, to this species, which is closely allied to *M. altissima* Blanco. Pierre doubtfully reduced the latter species to *M. Rumphii*. But, for the present, the two species should be kept separate rather than merged, until further collections from the Moluccas are available. For the primary forests of Luzon are far away from Banda in the Moluccas. Pierre did not mention a "type" of this species.

Distribution.—BANDA (Molucca).

25. *Mangifera philippinensis* sp. nov.

M. monandrae affinis, sed recedit foliis maioribus ellipticis, petiolis firmis, longioribus, inflorescentiis longioribus multiramosis dense floriferis; floribus maioribus, petalis ellipticis costis diversis ornatis et discis elevatis.

Arbor 13 m. alta. *Folia* magna subcoriacea, elliptica, breviter acuminata, basi cuneata, nervis circiter 12-jugis subtus prominentibus, divaricatis marginem arcuatis, utrinque valde subtus reticulata; laminae 13–19 cm. x 7–8.3 cm.; petioli firmi basi incrassati, 4–5.5 cm. longi. *Paniculae* terminales, glabrae, ramis 5–6, erectis, 11–19 cm. longis, ramis secundariis, 3–4 cm. longis plus 3-ramosis. *Flores* 3 in ultimis cymis, circiter 4.5 mm. longi; pedicelli 1 mm. longi. *Sepala* 4 ovata, obtusa, 2 mm. x 1.5 mm. *Petala* 4 elliptica, acuta, apicibus incurvatis canaliculatis; costae 5, mediae (3) prominentes, e basi divergentes, 3.5 mm. x 2 mm. *Discus* incrassatus cupuliformis, ovarium fere tegens, 1.5 mm. altus, indistincte 4-lobatus, lobi leves. *Stamina* 4, uno fertili 2.5 mm. longo, staminodiis 2 minutis bidentatis. *Ovarium* globosum; stylus lateralis, 3 mm. longus.

Tree 13 m. high, 15 cm. diam. at breast height. *Leaves* big, thinly coriaceous, elliptic, shortly acuminate, narrowed to the cuneate base; nerves about 12 pairs slightly prominent beneath, spreading, arched at margins; reticulations fine, prominent on both surfaces, especially beneath; lamina 13–19 cm. x 7–8 cm.; petiole stout, thickened at base, 2.0–5.5 cm. long. *Panicle* terminal, glabrous; a fascicle of 5–6 stout erect branches, 11–19 cm. long; secondary branches 3–4 cm. long with more than 3 tertiary branches. *Flowers* 3 on ultimate cymules 4.5 mm. long; pedicel 1 mm. long. *Sepals* 4, ovate, obtuse, 2 mm. x 1.5 mm. *Petals* 4, elliptic, acute, the tip incurved to form a boat-like structure; ridges 5, 3 at the centre prominent, reaching up to middle, divergent from a broad base; 3.5 mm. x 2 mm. *Disc* swollen, cupular, almost covering the ovary, 1.5 mm. high, obscurely 4-lobed, lobes shallow, 1 deeper. *Stamens* 4; 1 fertile 2.5 mm. long; staminodes 2, minute, teeth-like. *Ovary* globose; style lateral, 3 mm. long. *Fruit* unknown.

This species has been described from a specimen (For. Bur. No. 26594), distributed as representing *M. monandra* Merr. It differs from the type of *M. monandra* Merr. in the following characters: larger elliptic leaves with longer stout petioles, longer inflorescence with numerous branches more densely flowered, larger flowers with elliptic petals having different type of ridges, and more elevated enveloping disc. These differences justify its separation as a new species. Ramos 1618 has been referred to this species, though they differ in the leaves and longer petals.

Flowering.—February to March.

Sheets examined.—PHILIPPINES: Leyte, Dagani, Forest of So., Kuting, bank of Kuting river, at 11 m., 28 March 1917, J. D. Sandique, For. Bur. No. 26594 (*type*). Samar, April 1914, M. Ramos 1618 (Philip).

Type.—J. D. Sandique, For. Bur. No. 26594 from Leyte, Philippines, in the Philip. Nat. Herbarium.

Distribution.—PHILIPPINES: Leyte, Samar.



26. *MANGIFERA HAVILANDI* Ridley, Kew Bull. 194 (1933).

A small glabrous *tree*. *Leaves* remote, elliptic, acutely cuspidate, cuspidata 1 cm. long; base cuneate; lamina 10–15 x 3.5–5.5 cm., thickly coriaceous, shining above; nerves thin, 8–9 pairs, veins more prominent below; petiole slender, swollen at base, 3–4 cm. long. *Panicle* of either mostly male or mostly hermaphrodite flowers, about 15 cm. long; branches 4–6 cm. long, short, widely separated, glabrous, laxly-flowered. *Flowers* pedicels slender, 2 mm. long. *Sepals* 4, ovate, acuminate or acute, minutely ciliate at margin, 2 mm. x 1.25 mm. *Petals* 4, lanceolate, acute, creamy white; ridges 3–4, branching from an erect trunklike base, yellow in male, orange-brown in hermaphrodite; 3–4 mm. x 1.5 mm. *Stamen* 1 fertile, 2 mm. long in male, longer in hermaphrodite; anthers two-celled, oblong, dark-coloured; staminodes completely absent. *Disc* thick, rugose, circular, lobed. *Ovary* oblong; ovule 1, anatropous; style lateral, longer than filament.

The description of the carpel is based on the hermaphrodite flowers of the specimen, Haviland and Hose 3368. Ridley reported them as "not known."

It resembles *M. longipetiolata*, but differs by its short, compact panicles, small elliptic leaves, much shorter sepals, and distinctly narrower petals (Ridley). The leaf with its thick texture, firmly reticulated nerves, and long acumen is characteristic of the species.

Flowering.—November.

Sheets examined.—BORNEO: Sarawak, near Kuching, Nov. 27, 1894, Haviland and Hose Nos. 3368 A and 3368. "Small tree, petal white. Stamen 1. Disc broad. Flowers mostly male only." (SAR) (Bz).

Type.—Haviland and Hose 3368 from Kuching, Sarawak, in Herb. Kew, London.

Distribution.—BORNEO: Sarawak (*type*).

27. *MANGIFERA RIGIDA* Blume Mus. Bot. Lugd. Bat., 1, 200 (1850); Miq. Fl. Ind. Bat., 1 (b) 633 (1859); Engler in DC. Mon. Phan., 4, 207 (1883).

A *tree* with very angular branches. *Leaves* thickly coriaceous, stiff, elliptic, acute, rounded at base, subundulate; lateral nerves nearly 12 pairs, prominent above; veins reticulated, more prominent below; lamina 13–17 cm. x 6–8 cm., petiole 1.5–2 cm. long, stout. *Panicle* terminal, glabrous, densely flowered, 10–19 cm. long; primary branches spicaeform, 10–15 cm. long. *Flowers* tetramerous, small, white, glabrous; pedicels 1 mm. long. *Sepals* 4, ovate; 1.5 mm. x 1.5 mm., wider at base. *Petals* 4, lanceolate, somewhat obtuse, nearly thrice the length of sepals; ridges 3 almost parallel confluent at short base, ending in tuberculate excrescences slightly beyond the centre; 4 mm. x 1–1.25 mm.; reflexed below the tip. *Disc* thick, cupuliform, obsoletely 4-lobed, 1 mm. high. *Stamens* fertile 1, 3 mm. long; staminodes very minute, bristle-like, inserted at the margins of the disc. *Ovary* subglobose, obliquely depressed; style lateral, as long as fertile stamen; ovule anatropous, attached to a point slightly above the base of the ovary, opposite to the lateral style. *Fruit* unknown.

Engler in DC. Mon. Phan. remarks, "An satis a specie priore (*M. quadrifida* Jack) diversa?" I have neither seen the hermaphrodite flowers nor the fruits, as the specimen I have examined bore only a few male flowers. Yet the species appears to be distinct from *M. quadrifida* Jack in its leaves and flowers. It is known only from Korthal's original collections.

Sheet examined.—SUMATRA: Korthals ex Herb. Hort. Bot. Bog. (*co-type*) (Bz).

Type.—SUMATRA: Korthal's specimen in Herb. Lugd. Bat.

Distribution.—SUMATRA, in the mountainous jungles.

28. MANGIFERA MAINGAYI Hook. f. Fl. Brit. Ind., **2**, 17 (1876); Engler in DC. Mon. Phan., **4**, 208 (1883); King in Journ. As. Soc. Beng., **65**, pt. 2, 469 (1896); Ridl. Fl. Mal. Penin., **1**, 522 (1922); Burkill Dict. Econ. Prod. Mal. Penin., **2**, 1406 (1935).

Local names.—Sapoong or Sampoong (Maingay), Machang Pulasan (Malay).

A tall glabrous *tree*; branches stout. *Leaves* coriaceous, elliptic-oblong, acute or shortly acuminate, base rounded; nerves 15–20 pairs, arched, prominent beneath; reticulations inconspicuous, slightly prominent below; midrib very stout, elevated below; lamina 10–23 cm. x 4–9 cm., raised between the nerves; petiole very stout, 2–5 cm. long. *Panicle* glabrous, pyramidal, 20–25 cm. long; branches spreading. *Flowers* 5 mm. across; pedicels slender. *Sepals* 4, ovate, obtuse. *Petals* 4, oblong, twice as long as sepals; ridges 3–5, confluent at base. *Stamens* 4, 1 fertile; rest minute, teethlike. *Ovary* globose; style subulate, subterminal. *Drupe* green, globose, 7–10 cm. x 5–7 cm.; stone elliptic, with very few fibers, 6–8 cm. x 4–5 cm.; testa papery.

In the absence of flowering specimens, the description of the flower is based on published accounts.

This species is closely related to *M. quadrifida* Jack, but is distinct on account of its pyramidal inflorescence with long peduncle, broader thickly coriaceous elliptic leaves with very stout petioles, and elliptic thick stones almost free from fibers (found in Corner's specimen from Singapore).

According to Hooker, this species has two varieties in Maingay's Herbarium: "one (called Sapoong or Sampoong), with larger leaves not narrowed into the petiole, opaque above, with sunk nerves, tumid between the nerves; the other (marked as truly wild) with brown (when dry) more shining leaves, narrowed into the petiole, more reticulated beneath, and the nerves not sunk." I could not verify these varieties as the collections secured from various herbaria, contain few specimens of this species.

Fruiting.—May.

Sheets examined.—MALAY PENINSULA: Johore; Kota Tinggi, Mawai Rd. (2nd mile), 23.4.1938, E. J. H. Corner 34948 (SING). S. Bekok, 8.5.1938, Corner 34970 (SING). Perak: Parit Buntar, 5.2.1938, Agric. Officer No. 34901. "Local name *Machang Pulasan*" (SING). Malacca: Alvius. "Vern. *Sirpum*."

Type.—Maingay's specimen from Malacca, in Herb. Kew, London.

Distribution.—MALAY PENINSULA: Malacca (*type*), Bukit Sabukor, Johore, Perak.

29. *MANGIFERA LONGIPETIOLATA* King in Journ. As. Soc. Beng., **65**, 470 (1896); Ridl. Fl. Mal. Penin., **1**, 522 (1922).

Tree 12–18 m. high; young branches stout, bark pale brown. *Leaves* coriaceous, oblong or elliptic-lanceolate, tapering to both ends, apex shortly acuminate; both surfaces pale when dry, distinctly reticulate; lateral nerves 16–20 pairs, thin slightly prominent below; midrib very prominent, raised below; lamina 18–24 cm. x 3.5–7.5 cm.; petiole 4–12 cm. long. *Panicle* sessile, quite glabrous, axillary also terminal; branches 6–7 fascicled at tip; ultimate branchlets short, lateral racemoid, bearing 8–12 pedicellate flowers at tip. *Flowers* waxy-white, 3 mm. across; pedicels short; bracteoles 1 or 2, minute. *Sepals* 4, ovate-lanceolate, unequal, glabrous, 3 mm. x 1.25 mm. *Petals* 4, larger than sepals, elliptic; ridges 3, vertical, tuberculate, confluent at broad base; 4 mm. x 2 mm. *Stamen* fertile 1, slightly shorter than petals, inserted on obscurely lobed cupular fleshy disc; staminodes absent; anther elliptic. *Ovary* “subglobose; style slightly lateral, slender” (King). *Fruit* unknown.

King made the following remark on the affinity of the species: “This resembles *M. quadrifida* Jack, but the ultimate branchlets of the panicle are longer, the flowers are more numerous and are racemose instead of being cymose as in *M. quadrifida*. The petioles moreover are longer in this and are dilated near the base; the main nerves of the leaves are more prominent and the reticulations are larger and more distinct, while the midrib is much stouter and more prominent on the lower surfaces. This grows at higher elevation than *M. quadrifida*. In the great length of its petioles it resembles *M. longipes* Griff.; but that has 5-merous flowers whereas flowers of this are 4-merous.”

From the above statement, it appears that this species is closely allied to *M. quadrifida* Jack in floral characters but has very distinct leaves. As large collections are missing, the status of the species can not be determined. Consequently it is retained as a separate species. In view of the fact that it is found in the same area, where *M. quadrifida* Jack occurs, but at a higher altitude, future collections may well justify its reduction to varietal status under *M. quadrifida*.

Flowering.—February.

Sheets examined.—MALAY PENINSULA: Larut Perak, dense rocky jungles at 2500–3000 ft., Feb. 1884, H. Kunstler 7266 (*co-type*) (CAL). Kedah, Alor Sta, March 1938, Jacob (SING).

Type.—H. Kunstler No. 7266 from Perak, in Herb. Kew, London.

Distribution.—MALAY PENINSULA: Perak, dense forest on Larut Hills at 2500–3000 ft. altitude (*type*).

30. *MANGIFERA QUADRIFIDA* Jack in Roxb. Fl. Ind., ed. Carey & Wall. **2**, 440 (1824); Walp. Ann. Bot. Syst., **1**, 200 (1848–49); Hook. f. Fl. Brit. Ind., **2**, 16 (1876); Engler in DC. Mon. Phan., **4**, 206 (1883); King in Journ. As. Soc. Beng., **65**, 471 (1896); Pierre Fl. For. Cochinch., t. 364 H (1897); Ridl. Fl. Mal. Penin., **1**, 522 (1922).

Local name.—Asam Kumbang (Malay).

Tree 12–18 m. high; branches glabrous, angular; dormant buds covered by a crown of scales. *Leaves* thickly coriaceous, elliptic-oblong to

oblong-lanceolate, apex subacute, base much attenuated; nerves 16-18 pairs, faint; reticulations faint especially above; lamina 10-20 cm. x 4-7 cm.; petiole slender, 2-4 cm. long. *Panicle* from the uppermost axils crowded together or terminal, glabrous, nearly 24 cm. long; branching near base, branches semi-erect; branchlets with 3-6 flowered cymules. *Flowers* 3 mm. across; pedicels short, glabrous; bracts ovate, puberulous. *Sepals* 4, orbiculate-ovate, glabrous, 2.25 mm. x 1.5 mm. *Petals* 4, elliptic, subacute, glabrous; ridges 3, united in a central column, ending in 3 divergent tuberculate excrescences; 4.5 mm. x 2 mm. *Disc* fleshy; 4-lobed in male, cupular and obscurely lobed in hermaphrodite. *Stamens* 4, 1 fertile, staminodes 3-4 minute teeth-like projections, attached to disc-lobes. *Ovary* ovoid, style subterminal, as long as fertile stamen. *Drupe* elliptic, dotted, 8 cm. x 5.5 cm.; epicarp leathery, mesocarp about 1 cm. thick; stone elliptic, coarsely fibrous, 5.5 cm. x 2.4 cm.; cotyledons unequal.

Though Hooker remarked about its similarity with *M. Griffithii* in flower and inflorescence, it can be easily distinguished from the latter by its longer glabrous inflorescence, and its flowers with longer, slender pedicels.

This species is based on a specimen collected by Jack at Penang, and described in a letter to Wallich. The description in Jack's manuscript was later published in Carey & Wallich's edition of Roxb. Fl. Indica.

Flowering.—January. *Fruiting*.—August.

Sheets examined.—MALAY PENINSULA: Perak: G. Buboo (300-1500 ft.), Jan. 1882, King's collector 2693 (CAL). Thaiping, open jungles on low hills at 200-300 ft. Jan. 1886, Kunsler 8444. "Leaves glossy, deep-green; flowers pale greenish white" (CAL) (SING). Bagan Serai, 17 March 1939, E. J. H. Berwick No. K 69 (SING). Parit Buntar, 5.3.1938, Drian 34699 (SING). Pulau Penang: Sepoy lines, April 1918, Md. Haniff 3423 (SING). SUMATRA: R. Rawai (1500 ft.), 1881, H. O. Forbes 3081 (CAL). S. E. BORNEO: 13.7.1908, Hubert Winkler 2940 (Bz).

Type.—Jack ex Wallich No. 8489 from Penang in Herb. Kew, London.

Distribution.—MALAY PENINSULA: Penang (*type*), Gunong Bubu, Thaiping, Perak Forests at 300-1500 ft. altitude. SUMATRA. BORNEO.

31. MANGIFERA SPATHULAEFOLIA Blume Mus. Bot., 1, 200 (1850); Miq. Fl. Ind. Bat., 1 (b), 633 (1859). *M. quadrifida* Jack var. *spathulaefolia* Engler in DC. Mon. Phan., 4, 207 (1883); Merrill in Journ. Str. Branch Roy. As. Soc., No. 86, 349 (1921).

A tree 12-15 m. high with rather thick, angular branches. *Leaves* obovate or spatulate-oblong, obtuse, rotundate or retuse, coraceous, shining above; veins prominently reticulated below, obscure above; 10-20 cm. long; petiole .5-1.5 cm. long. *Panicle* terminal as also axillary, glabrous, subcorymbose with spicaeform branches densely flowered. *Flowers* subsessile, tetramerous; 3-5 aggregated on branch tip. *Sepals* 4, ovate, obtuse, ciliate at apex; 2.25 mm. x 2 mm. *Petals* 4, oblong-lanceolate, obtuse; ridge columnar ending in 3 unequal tuberculate portions, raised from the surface of the petals at the tuberculate end; 4 mm. x 2 mm. *Disc* fleshy, cupular, surrounding the ovary at base; obscurely 4-lobed. *Stamen* 4, 1 fertile, shorter than

petals, attached to the inner side of the disc-lobe; rest reduced to short teeth-like projections. *Ovary* globose; style lateral, 2 mm. long, slightly longer than the filament. *Fruit* not known.

Engler (1883) reduced the species to a variety of *M. quadrifida* Jack. After examining Korthal's specimens, on which the species is based, I am of the opinion that it may be retained as a species on the basis of differences in (i) leaf-shape, shorter petiole, (ii) inflorescence-branching, and (iii) the ciliate sepals.

It is very poorly represented in herbaria, and known only from Korthal's collections.

Sheets examined.—BORNEO: Korthals ex Herb. Hort. Bot. Bog. (*Co-type*) (Bz).

Type.—Korthal's specimen from Bengoviran, Borneo, in Herb. Lugd. Bat.

Distribution.—BORNEO: Bengowiran (*type*).

32. *MANGIFERA TIMORENSIS* Blume Mus. Bot. Lugd. Bat., **1**, 199 (1850); Miq. Fl. Ind. Bat., **1** (b) 633 (1859); Engler in DC. Mon. Phan., **4**, 208 (1883). *M. glauca* Spanoghe in Linnaea, **15**, 188 (1841).

Leaves thinly coriaceous, oblong lanceolate, acute or subacute at apex; lateral nerves about 15 pairs, thin and immersed; reticulations not so prominent; lamina 10–18 cm. x 3–5 cm., petiole slender, 2.5–5 cm. long. *Panicle* terminal, branching from the base, branches spreading, glabrous, 15–20 cm. long; secondary branches 15 cm., tertiary 4 cm., and ultimate branches 1 cm. long. *Flowers* tetramerous; polygamous in ultimate cymulose branches; pedicels 1–2 mm. long; bracteoles lanceolate, acute. *Sepals* 4, ovate, acute, hyaline at margins, 2–2.5 mm. x 1.5–2 mm., more elongated in hermaphrodites. *Petals* 4, ovate-oblong, twice as long as sepals, obtuse; ridges 5–7 exerted at apex, diverging from a common broad base at different heights, 3 at centre more prominent; in hermaphrodite 4 mm. x 2.5 mm., in male 3–3.5 mm. x 2 mm. *Disc* 4-lobed; lobes thick undefined, surrounding the ovary in hermaphrodite, distinct and smaller in male. *Stamen* 1 fertile, shorter than petals; staminodes 3, very minute or absent, inserted on the inner margin of disc-lobes. *Ovary* globose, glabrous; ovule 1, with short funicle, campylotropous; style sublateral. *Drupe* globose, as big as that of a *Prunus*.

This species is poorly represented in all collections. It is known mainly from Spanoghe and Zippelius' specimens.

Sheets examined.—TIMOR ISLAND: Zippelius ex Herb. Hort. Bot. Bog. (Bz).

Type.—Spanoghe's specimen from Timor, in Herb. Lugd. Bat.

Distribution.—TIMOR ISLAND, in mountains (*type*). BANDA ISLAND.

33. *MANGIFERA MONANDRA* Merrill in Philip. Govt. Lab. Bur. Bull., **17**, 28 (1904); Merrill Enum. Philip. Fl. Plants, **2**, 468 (1923).

Local name.—Malapaho.

Tree medium sized entirely glabrous, branches greyish-brown. *Leaves* thinly coriaceous, lanceolate or obovate-lanceolate, acute or very shortly and bluntly acuminate, narrowed to cuneate base; nerves 11–13 pairs about 1 cm. apart; reticulations fine, distinct beneath nearly

obsolete above; 9-16 cm. x 2.5-6.5 cm.; petiole 1-4 cm. long, rugose. *Panicle* glabrous, terminal as also axillary; sessile with 3-4 fascicled branches; laxly flowered; 10 cm. long or less, reaching up to 20 cm. during fruiting; secondary branches about 3 cm. long with 2 short



FIG. 30. Cotype of *M. monandra* Merr. (from Ahern's collector 414).

tertiary branches. *Flowers* white, 3.5 mm. long; pedicels about 1 mm. long. *Sepals* 4, broadly ovate, acute, 2-2.5 mm. x 1-1.5 mm., hyaline at margins. *Petals* 4, ovate, obtuse; ridges 5-7, prominent, confluent at a broad base, not extending up to middle; 3 mm. x 1.5 mm. *Disc*

swollen, obscurely lobed; 2 mm. by 1 mm. *Stamen* fertile 1 rarely 2, filament about 1 mm. long; staminodes 2-3, very minute, teeth-like, or obsolete. *Ovary* globose, glabrous; style subterminal, 1.5 mm. long. "*Drupe* ellipsoid, subcompressed, inequilateral; 3.5 cm. x 1.8 cm. x 1.5 cm., the pulp very thin." (Merrill).

Flowering.—February. *Fruiting*.—June-July.

Sheets examined.—PHILIPPINES: Luzon, Risal, Antipolo, Feb. 1904, Ahern's Collector, For. Bur. No. 414 (*co-type*). (Bz) (SING). Camarines, June 1908, H. M. Curran 10698 (PHILIP).

Type.—Ahern's collector, For. Bur. No. 414 from Luzon, in Philip. Nat. Herbarium.

Distribution.—PHILIPPINES: in the forests of Togalog and other places at low altitudes.

Var. *fasciculata* var. nov.

Paniculae dense florigerae, sessiles; rami circiter 12, fasciculati. *Staminodia* 7-8, brevissima, dentata; filamenta sinuosa.

Panicle densely flowered, sessile; branches about 12, fascicled. *Staminodes* 7-8, very short, teethlike; filament sinuous.

Sheet examined.—PHILIPPINES: Luzon, Rizal, Bosoboso, Feb. 1907, M. Ramos 2102; in Herb. Hort. Bot. Singapore (*type*).

Economic uses.—The timber, which is locally used, is not of a good quality (Burkill).

34. MANGIFERA ANDAMANICA King in Journ. As. Soc. Beng, **65**, pt. 2, 470 (1896); Fl. Assam, **1**, 336 (1937).

Tree perfectly glabrous, 9-12 m. high, 1.5-1.75 m. in circumference; bark pale. *Leaves* thinly coriaceous, broadly oblanceolate or obovate-elliptic; apex rounded, finely cut at the tip; gradually narrowed from above the middle to the broad channeled petiole; shining above, paler below; nerves 10-12 pairs, about 1 cm. apart, slightly prominent beneath; reticulations fine, prominent on both surfaces; lamina 9-16 cm. x 2.5-6.5 cm.; petiole 2.5-3 cm. long. *Panicle* forming a terminal fascicle of 3 or more branches, 10-20 cm. long; secondary branches many, slender, glabrous. *Flowers* dense, quite glabrous; pedicels short. *Sepals* 4, ovate lanceolate, subconcave, glabrous, 3 mm. x 1.5 mm. *Petals* 4, broadly ovate-lanceolate, 4.75 mm. x 2.5 mm.; ridges 5-6, slender, confluent at a prominent broad base. *Stamens* 4, fertile 1, 2.5 mm. long; staminodes 3, teeth-like, attached to inner-side of disc-lobes. *Disc* fleshy, cupular, deeply 4-lobed. *Ovary* immersed in the disc, globular or slightly pressed on one side, smooth; style subterminal, 2.5 mm. long. *Fruit* unknown.

This species closely resembles *M. monandra* Merr., from which it can be distinguished by the broadly obovate leaves and bigger flowers.

It has been included in the Flora of Assam and reported to occur at the foot of Mikir Hills near Barapathar, Sibsagar. The collection from Assam consists of a single number, U. N. Kanjilal 2103 from Gudum Teron, Sibsagar, distributed to the Sibpur, Dehradun, Shillong and other herbaria. An examination of one of these, consisting of leaves



FIG. 31. Type of *M. monandra* Merr. var. *fasciculata* var. nov.
(from Ramos 2102).

and a fruit, suggests that it belongs to some genus other than *Mangifera*. Hence its occurrence in Assam is doubtful.

Flowering.—January to April.

Sheets examined.—ANDAMANS: Mt. Harriett, 15 June 1884, Dr. King's collector No. 39 (CAL). Hilly jungle, Holedaypur, 25 April 1891, Dr. King's collector (CAL). Assam (?): Sibsagar, Gudum Teron (300 ft.), 22 Feb. 1913, U. N. Kanjilal 2103 (CAL) (DD) (ASSAM).

Type.—King's Collector's Specimen from Andaman Islands, in Herb. Kew, London.

Distribution.—ANDAMAN ISLANDS.

II. Disk minute or absent.

A. Petals free from the disk.

35. *MANGIFERA LAGENIFERA* Griff. Notul. **4**, 414 (1854), t. 567, fig. 3; Hook. f. Fl. Brit. Ind., **2**, 18 (1876); Engler in DC. Mon. Phan., **4**, 211 (1883); King in Journ. As. Soc. Beng. **65**, 476 (1896); Pierre Fl. For. Cochinch., t. 365 C (1897); Ridl. Fl. Mal. Penin., **1**, 525 (1922); Craib Fl. Siam. Enum., **1**, 344 (1931).

Local name.—Lanjut or Langoot (Malay).

Tree 15–30 m. high, with round crown; young branches stout; leaf-scars prominent on older portions; bark fawn-brown, slightly fissured. *Leaves* coriaceous, obovate-oblong to obovate-spathulate, obtuse or rounded at apex, narrowed towards base, ultimately decurrent on short flattened 2–3 cm. long petiole; lateral nerves 16–20 pairs, very faint; veins inconspicuous; lamina 8–16 cm. x 3–4.5 cm.; midrib flattened. *Panicle* purple, puberulous, 20–30 cm. or more in length; peduncle very stout, mostly without any secondary branches from lower half; a crown of oblong-lanceolate scaly structures encircling the base; sometimes the panicle becomes fasciculate with branches arising from the base. *Flowers* velvety-black, violet towards centre, 1 cm. or less in diam.; pedicels puberulous, shorter than flowers, bracteoles ovate, large, downy outside, covering the flower buds. *Sepals* 5, broadly ovate, deeply concave, pubescent outside; 2.5–3 mm. x 2 mm. *Petals* 5, purple, free from the disc, 3–4 times as long as sepals, oblanceolate or subspathulate, obtuse, thick, reflexed just above the calyx; glandular ridges absent; 7–8 mm. x 3.25 mm. broad. *Stamens* 10, connate at base; 5 perfect nearly as long as petals (6–7 mm.); rest reduced to short, pointed, bright purple, 1 mm. long filaments; anther yellow, ovate. *Disc* slender, cylindric, stipitate. *Ovary* obliquely ovoid, glabrous, placed on a short stipe; style lateral, slender, as long as the filaments, bent like a bow. *Drupe* lageniform, foetid-smelling, 10–12 cm. x 5–6 cm.; epicarp thin, "pale green with a pink flush mesocarp about 2 cm. thick, entirely traversed by innumerable fibers, purplish flesh-colored; stone fibro-coriaceous, adherent to the membranaceous testa" (Maingay). *Seed* "erect, oblong-lanceolate, adhering to the black tegument on one side, on the other smooth; cotyledons with one-half the surface smooth, the other wrinkled, one is longer than the others; radicle stout, short, a little above the base" (Griffith).

Pierre found that the species resembles *M. cochinchinensis* Engl. and *M. zeylanica* Hook. f. in its leaves, but that it differs from them in the 5 barren filaments alternating with the 5 fertile stamens. He also recognized that it approaches *M. superba* Hook. f. in its stamens and leaves. But it can easily be distinguished from *M. superba* by its smaller less coriaceous leaves, and flowers. The distinct features of the species are the lageniform fruit, the leaves, the panicle without branches from the lower half of the peduncle, and the crown of scaly structures encircling the base of the peduncle.

Flowering.—January. *Fruiting*.—May.

Sheets examined.—MALAY PENINSULA: Perak: Open jungles, low ground, Sept. 1886, Dr. King's Collector 10993 (CAL). Father Scortechini 633 ex. Herb. Mus. Perak (CAL) (SING). Singapore: 1893, Ridley 4777 (CAL) (SING). Malacca: Griffith 1104 (*co-type*) (CAL). Maingay 469 (CAL). Batang Malaka, 30 Jan. 1916, Burkill 1437 (Bz). Feb. 1936, E. J. H. Corner. "Very poisonous tree" (SING). Johore: Kulai, 18 June 1939, Corner. "Wild Lanjut. Bark fawn-brown, slightly and broadly fissured" (SING). Ulu Kahang (350 ft.), May 1923, Holtum 10997. "Large tree over 100 ft. trunk 22½ ft. in diam." (SING). Mawai, 8 Jan. 1938, Corner 34701 and 34705 (Bz). Pahang: 18.3.1931, Forster 14086 (SING). SUMATRA: Karimoen: Riowen, 3 Oct. 1932, Zwart 5 (Bz).

Type.—MALACCA: Griffith No. 1104 in Herb. Kew, London.

Distribution.—MALAY: Malacca (*type*). Common in orchards and villages throughout the peninsula and islands. SIAM. SUMATRA.

Economic Importance.—Only the fruit is used as food. But it is not well liked, as the fruit is coarse (Burkill).

36. MANGIFERA MACROCARPA Blume Bijdr., 1158 (1826); Blume Mus. Bot. Lugd. Bat. 1, 201 (1850); Miq. Fl. Ind. Bat., 1 (b), 634 (1859); Engler in DC. Mon. Phan., 4, 210 (1883); Pierre Fl. For. Cochinch., t. 364 D (1897); Lecomte Flor. Indoch., 2, 16 (1908); Crevost and Lemarie Cat. Prod. Indochine, 1, 234 (1917)—*M. fragrans* Main-gay Mss. in Hook. f. Fl. Brit. Ind., 2, 18 (1876); King in Journ. As. Soc. Beng., 65, pt. 2, 475 (1896); Ridl. Fl. Mal. Penin., 1, 524 (1922).

Local names.—Mangga utan (Malayan), Gompoe (Sundanese in Java), Madjoe (Anambas Isl.), Kayu Bansiku (North Borneo).

Tree up to 38 m. high; branches glabrous, angular when young. *Leaves* thinly coriaceous or membranaceous, very narrow, much elongated, tapering towards the two ends; apex acuminate, acute or sub-acute; margin undulate; lateral nerves 25–40 pairs, horizontal; lamina 25–40 cm. x 2.5–5 cm.; petiole slender, much elongated, 3–5 cm. or more long. *Panicle* from the uppermost axils, 15–20 cm. long, glabrous, stout, spreading. *Flowers* erect, about 8 mm. long; pedicel turbinate. *Sepals* 5, unequal, ovate-lanceolate, nearly 3 mm. long. *Petals* 5, linear-lanceolate; reflexed sharply from middle; free from disc; 8–9 mm. long; ridges 1–3, prominent. *Disc* stipitate. *Stamens* 5, 1 fertile; the rest with imperfect anthers, about half as long as the fertile stamen. *Drupe* obliquely oblong-globose, of the size of a child's head; flesh yellow, acid and terebinthine; stone thin, fibrous, 8 cm. x 4 cm.; cotyledons 2, smooth, elliptic, 6.5 x 2.5 cm.

In the absence of flowering specimens, the description of the flower is taken from previous works. I agree with King and Ridley who

regard *M. fragrans* Maingay as a synonym of this species. Hooker made the following remarks on the similarity between the two species: "This in foliage approaches very closely to Blume's *M. macrocarpa* of Java, which has still narrower leaves with crimped edges, 40 pairs of nerves, and a bitter-sweet fruit as large as a child's head."

Fruiting.—February (Blume).

Sheets examined.—MALAY PENINSULA: Kelantan, Sungai Tekal, Gua Minik, 28 Oct. 1927, Henderson 19713. "Small tree quite common, but always sterile. Juice has sweet smell, rather like Lemons" (SING). JAVA: Blume ex Herb. Lugd. Bat. (Bz). 4398 H. B. (ex Herb. Hort. Bot. Bog.) (Bz). Batavia, Pasir Sireunjit (600 m.), 8 June 1924, R. C. Bakhuizen V/D Brink 6411 (Bz). ANAMBAS ISLAND: (250 m.), 2 April 1928, Van Steenis 903. "Madjow" (SING) (Bz). NORTH BORNEO: Kabil-Sepilok F. R., Top of high hill, 11 June 1937, Enggoh 7284. "Local name Kayu Bansiku. Tree 125 ft. high, 50 in. in diam.; fruit edible; no flower or fruit seen at the time of collection" (SING). Elphinstone Province, Tawao, Oct. 1922–March 1923, Elmer 21353 (Bz).

Type.—Blume's specimen from Java, in Herb. Lugd. Bat.

Distribution.—JAVA in mountains (*type*). MALACCA: rare and probably introduced (Ridley). SUMATRA. BRITISH NORTH BORNEO. ANAMBAS ISLAND. Cambodge. INDOCHINA (Pierre).

A. *Petals adnate to the disk*.

B. *Panicle glabrous*.

37. MANGIFERA FOETIDA Lour. Fl. Cochinch., 160 (1790); Willd. Spec. Plant., 1, 199 (1797); Roxb. Fl. Ind., ed. Carey and Wall. 2, 440 (1824); DC. Prodr., 2, 63 (1825); Blume Mus. Bot. Lugd. Bat., 1, 199 (1850); Miq. Fl. Ind. Bat., 1 (b), 632 (1859); Hook. f. Fl. Brit. Ind., 2, 18 (1876); Kurz For. Fl. Brit. Burma, 1, 305 (1877); Engler in DC. Mon. Phan., 4, 212 (1883); Warburg in Engl. Bot. Jahrb., 13, 361 (1891); King in Journ. As. Soc. Beng., 65, pt. 2, 474 (1896); Lecomte Flor. Indoch., 2, 15 (1908); Crevost and Lem. Cat. Prod. Indochine, 1, 235 (1917); Lauterb. in Engl. Bot. Jahrb., 56, 354 (1921); Ridl. Fl. Mal. Penin., 1, 524 (1922); Craib Fl. Siam. Enum., 1, 343 (1931); Ridley in Kew Bull., 194 (1933).—*Manga foetida* Rumph. Herb. Amb., 1, 98 (1741), t. 28; Merrill Interptn. Rumph. Herb. Amb., 329 (1917). *Mangifera indica* Blume Bijdr., 1157 (1826), non syn. Linn. *M. foetida* Griff. Not., 4, 419 (1854). *M. Horsfieldii* Miq. Fl. Ind. Bat., 1 (b), 632 (1859). *M. Leschenaultii* Marchand Des Terebin., p. 189. *M. foetida* Lour. var. *Blumii* Pierre Fl. For. Cochinch., t. 365G (1897).

Local names.—Bachang, Machang, Machang-utan (Malay); Pelem Bawang, Batjang, Limoes, Pakil (Java); Limus, Embachang, Batjang Oetan, Ambatjang (Sumatra); Lamut (Siam); La-mote (Burma); Ambachan, Bachan, Bichang (Amboina); Xoai hoi, Soai ca lam (Cochinchina); Paoh (North Borneo); Manga hoetan (Celebes).

Tree 18–24 m. high; young branches stout; bark pale when dry. *Leaves* very thickly coriaceous, stiff, elliptic-oblong to broadly elliptic, sometimes slightly obovate, emarginate or rounded at apex, base slightly cuneate; upper surface more shining when dry, raised between stout nerves; lateral nerves about 20 pairs, bold, more elevated below; reticulations indistinct or obsolete on both surfaces; lamina 15–30 cm. or more x 5–9 cm.; petiole 2–6 cm. long, stout specially at base. Panicle

terminal or axillary; 30 cm. or more in length, stout, glabrous, blood-red when fresh, black when dry; branches stout, suberect; branchlets scattered, cymose with 4 or more flowers; bracteoles minute. *Flowers* deep-red, pink inside; 1 cm. long, 6 mm. across; pedicels thick, 1 mm. long. *Sepals* 5, thick, ovate-lanceolate, deeply concave, sub-acute, glabrous; 4 mm. x 2.5 mm. *Petals* 5, adnate to the disc, reflexed slightly above the calyx; linear-oblong, acute; ridge elongated, 3-fid confluent at base; 8-9 mm. x 2-2.5 mm. *Stamens* 5, connate at base with short torus; 1 perfect nearly as long as petals (8 mm.); rest shorter, unequal, with sterile knoblike anthers, nearly 5 mm. long. *Disc* very short, pedicel-like, adnate to the swollen base of filaments. *Ovary* sub-ovoid, glabrous; style slender subterminal, longer than fertile stamen. *Drupe* green, oval not compressed, apex oblique, with a very foetid smell; 8-10 cm. x 6 cm. x 4-6 cm.; exocarp thin, with whitish tomentum, dotted; mesocarp nearly 2 cm. thick, stringy. *Stone* thick, fibrous, hard, 2-edged like that of common mango, 7 cm. x 3-4 cm. Integument chartaceous, whitish (brown inside); cotyledons equal, closely pressed, oblique at base, each with an auricle incumbent on the apex of the radicle; radicle short, almost at right angles with the cotyledons; plumule conspicuous.

Examination of the material of this species from various herbaria disclosed two types of specimens. The second type differs from the first in having large, broadly elliptic leaves (44-50 cm. x 15-17 cm.), whereas the inflorescence and flowers are the same in both types. The broad leaved specimens are from Malaya (H. Kunstler No. 6051, E. J. H. Corner, and I. H. Burkill). The second type may be a race of *M. foetida* Lour.

The species is based on Loureiro's specimen from Cochinchina, found in cultivation, and partly on Rumphius' *Manga foetida*.

Flowering.—Almost throughout the year in different localities, but mainly in two flushes, once during December-March and again during May-July. *Fruits* mature during March-June and again in November.

Sheets examined.—MALAY PENINSULA: Malacca: Griffith 1099 (CAL); Maingay 472 (CAL). Gopong: In rocky jungles (500-800 ft.), May 1884, H. Kunstler 6051 (CAL) (SING). Perak: Father Scortechini 2064 ex Herb. Mus. Perak (CAL). Taiping, 9 July 1936, E. J. H. Corner (SING). Bagan Serai, Feb. 1939, Bereick 68 (SING). Singapore: Pulau Tekong, Oct. 1890, Ridley 1810 (CAL). Surong, 1893, Ridley 4776 (CAL). 1822, Wallich Catalogue 8488B (CAL). Bot. Garden, 17.8.36, Marzuki 31699 (SING) (Bz). Penang: March 1884, C. Curtis 1747. "Bachang. Cultivated" (CAL) (SING). Johore: Mawai-Jamaluang Road, 8.3.1938, E. J. H. Corner 34909 (Bz) (SING). Jadon Bay, 13 June 1934, Corner (SING). Pulau Tinggi, June 1915, Burkill (SING). Pahang: May 1922, Ridley (SING). BURMA: Tenasserim: Mergui, April 1911, Meebold 14921 (CAL). River side, 14 Jan. 1926, Parkinson 1601. "Local name Lamut. Cultivated tree, 40 ft. high looking much like an ordinary mango tree. Flowers purplish. Fruit eaten" (Dd). SUMATRA: Palembang: 4 Dec. 1922, Dorst T-IP-760 (Bz). East coast: Kisarin, Asahan, Yates 2560 (Bz). West Coast: Ophir, Watas Panti (930 M.), 26.3.1924, Maharadja No. 8 "Vern. Rangeh" (Bz). East Coast: Medan, May 1929, Ochse. "Batjang" (Bz). Sibolangit (500 m.): 12 Aug. 1921, Lorzing 8491 (Bz). JAVA: T. Horsfield ex Herb. T. Horsfield: representing *M. Horsfieldii* Miquel; Blume ex Herb. Lugd. Bat., representing *M. foetida* Lour. var. *sphaeroidea* Bl. (Bz). Kosaca Bauand (2000 ft.); Dec. 1897, Forbes 356 (CAL). Pandeglang: Sangiang, 2 April 1937, N. Burer 8. "Limoes" (Bz). Yapara: Soemanding (600 m.), 20 May 1936, Wageman 38. "Pakil" (Bz). Pekalongan (100 m.): 23 July 1922, C. Boot 3355 (Bz). Soebah, 1892, Koorders 11396B (Bz). Saltiga: 8 July 1909, Leenwen-Reijnvaan (Bz). Djakdja: Goenoeng Kidoel, 23 Sept. 1928, Ochse. "Pakil" (Bz). Bogor: Kota Batoe, De Monchy. "Ambatjang" (Bz). Batavia: Pal

Merah (20 m.), 15 May 1904, Backer 32274. "Cultivated" (Bz). Buitenzorg (250 m.), 24 Nov. 1924, Bakhuizen V/D Bring 3523. "Cultivated. Batjang & Limoes" (Bz). Ragoenan, Pasan Minggoe, 24 Nov. 1926, J. J. Ochse. "Batjang" (Bz). Ngarengan: Djaewana, Djapara, 22 May 1897, May-June 1899. S. H. Koorders Nos. 32961 B, 35124 B, 35570 B. "Cultivated. (Bz). Pasoeroean: Toeren and Kependjen, 26 June 1896, Koorders 23728 B. "Pakil" (Bz). Noesa-kambang: Tjilatjap, Banjoemas (50 m.), 6 Dec. and 8 Dec. 1891, Koorders 409 B & 411 B. "Cultivated. Batjang, Limoes, and Pakil" (Bz). Preanger: Soeka-boemi, Palaboeauratoe, 17 May 1890, 23 April 1893, 23 March 1899, Koorders Nos. 388 B, 12286 B, and 34241 B (Bz). Wanaradja, Pangentjongan, 19 July 1893, Koorders 13910 B (Bz). Tasikmalaja (720 m.), 1 Aug. 1917, Koorders 47761 B (Bz). Sanggrawa: Djampangkoelon, 5 July 1890, Koorders 389 B (Bz). BORNEO: Sarawak, Kapit, Upper Rejang River, J. & M. S. Clemens 21096 (Bz). West Koetei, Boekit-La jang, Nov.-Dec. 1931. "Alim Pajang" (Bz). East Koetei, Bengalon Rapak, Bengalon, 27.4.31, A. Hamid 18. "Asampajang" (Bz); Takat, 3.6.28, Hamid 24 (Bz); Beneden-Matan, Klampai, 22.8.30, C. C. 14392. "Hembawang" (Bz). North Borneo: Kabili Sepilok, Hilly tract, 24.2.37, Mendosa 4603. CELEBES: Malili, Kawata (350 m.), 27 Sept. 1932, Waturandang 47. "Mangga hoetan." AMBOINA: July-Nov. 1913, C. B. Robinson, *Plantae Rumphianae Amboinenses* No. 126: representing *Manga foetida* Rumph. (Bz).

Distribution.—BURMA: Tenasserim (cult.). MALAY PENINSULA: Penang, Singapore, Malacca. COCHINCHINA: Tonkin (*type*). SIAM. JAVA. SUMATRA. BORNEO (Sarawak). AMBOINA (*Manga foetida* Rumph.). WESTERN NEW GUINEA. CELEBES.

Economic value.—Burkill in Dict. of Econ. Prod. of Mal. Penin. **2**, 1402, (1935), writes: "A considerable tree, cultivated and encouraged in a semi-wild state throughout Malaysia, and so encouraged as to be one of the commonest of its genus in Malay. There are races of it but they have never been identified."

FOOD.—"The fruits when immature are quite inedible, but are much eaten when ripe, in which state they are still green; their flavour is coarse, their smell objectionable, but the flesh is rather sweet. They are chiefly used in curries and are pickled by salting. Sometimes they are made into sweetmeats."

MEDICINAL.—The resinous sap in the stem has an irritant action on the skin. It is recommended in the Medical Book of Malayan Medicine (Gard. Bull. S. S. **6**, 1930, p. 352) in the form of a lotion made from the bark for treating an ulcer. It is the same irritant sap which makes the fruit quite inedible, and if the fruit-flesh is applied to the skin before it is ripe, it produces an inflammation. Intestinal troubles result from injudicious eating of the fruit.

TATTOOING.—The same juice is used to deepen tattoo scars (Evans in Journ. F. M. S. Mus. **9**, 1920, pp. 22).

TIMBER.—The timber is yellowish or pale grey in colour, with coarse fiber and not durable. If used it should be for temporary articles, and article kept away from damp and rain. Moll and Jansonnus (Mikrogr. d. Holzes Java, **2**, 1908, p. 467) have described its minute structure.

38. MANGIFERA ODORATA Griff. Notul., **4**, 417 (1854); Fl. Brit. Ind., **2**, 17 (1876); Engler in DC. Mon. Phan., **4**, 210 (1883); King in Journ. As. Soc. Beng., **65**, pt. 2, 474 (1896); Crevost and Lem. Cat. Prod. Indochine, **1**, 235 (1917); Ridley Fl. Mal. Penin., **1**, 524 (1922); Merrill Enum. Philip. Fl. Plants, **2**, 468 (1923); Ridley in Kew Bull., 194

(1933).—*M. foetida* Lour. var. *odorata* Pierre Fl. For. Cochinch., t. 365 B (1897). *M. foetida* Lour. var. *cochinchinensis* Pierre, l. c., t. 365 E. *M. foetida* Lour. var. *Kawinii* Blume in Pierre l. c., t. 365 F.

Local names.—Koeene, Kohini, Kwini (Malaya); Kibembem, Kwini, Kuwini, Kwene (Java); Bimbe, Bembem, Kawini (Sudanese); Ambachang, Embachang, Kuwini (Sumatra); Huani, Kandope (Philippines); xoai huong (Indochina).

Tree nearly 30 m. tall. *Leaves* coriaceous, oblong or elliptic-lanceolate, shortly acuminate; reticulations fine on both surfaces especially lower; lateral nerves about 20 pairs, very prominent beneath; lamina 15–30 cm. x 5–10 cm., subundulate at margins; petiole 3–6 cm. long. *Panicle* dark green, longer than leaves, stout, glabrous or shortly puberulous. *Flowers* odorous, flesh-coloured; about 7 mm. long, 5 mm. in diam.; pedicel slender, 2 mm. long. *Sepals* 5, red, ovate-lanceolate, acute, hyaline at the margins, 3 mm. x 1.5 mm. *Petals* 5, greenish, suffused with blood-red, adnate to disc at base; oblong-lanceolate, cordate at base; reflexed from middle; ridge elevated at base, branching upwards into 3 short arms reaching up to middle; 6 mm. x 2 mm. *Stamens* 5; 1 rarely 2 fertile (about 5 mm. long), rest reduced to short subulate structures (2–3 mm. long) with knoblike barren anthers at tip; filaments blood-red, swollen, connate at base with the short disc; anthers purple-lilac. *Disc* short. *Ovary* glabrous, globose; style sublateral, almost as long as petals. *Drupe* oblong with a beak below the apex, 10 cm. x 5–6 cm. "with a very bad odour, yellowish green with yellow spots and a central disc of reddish colour. Flesh yellow, not unpleasantly scented, not turpentinous, very fibrous, sweet and plentiful, so that culture might make this a good fruit. Stone very much compressed, covered with torn fibres, rather thick, lined with a parchment-like substance with oblong white markings. Seed compressed, very sub-reniform; cotyledons rugose, equal at base, one over-lapping at the top" (Griffith).

Var. *PUBESCENS* Engler in DC. Mon. Phan., 4. 210 (1883). Panicle and calyx shortly pilose.

Griffith observed the close affinity of the species with "*Bachang*" (*M. foetida* Lour.), but separated it from the former because of differences in leaf, fruit and seed characters. Hooker also supported the separation of the two species, and put forward further corroborative evidence, e. g., "petals free from the disc" in *M. odorata* and "adnate" in *M. foetida*. Engler (1883) accepted the same view. But examination of liquid and herbarium material shows that the flowers of both species have petals adnate or inserted at the base of the disc. It is likely that, on the basis of this character, Pierre (1897) reduced *M. odorata* Griff. to varietal status under *M. foetida* Lour. In spite of such resemblances, I feel that the two species should be kept separate, due to the differences in leaves, size of flowers, and in fruit and seed.

M. foetida Lour. var. *Kawinii* Blume, which was reduced by Pierre to *M. foetida* Lour., has been transferred to *M. odorata* Griff., the local name of which is *Kwini*, whereas the local name for *M. foetida* is *Bachang*. These local names of wild and semiwild mangoes are fixed and therefore justify the transfer of var. *Kawinii* to *M. odorata*.

Flowering.—Almost throughout the year from February to October.
Fruiting.—Mainly during October.

Sheets examined.—MALAY PENINSULA: Singapore: Bukit Timah, 1893, Ridley 4773. "Kwini" (CAL.); Irwell Bank Rd. 26 June 1936, Corner 30799 (Bz) (SING); Kelantan State: Kota Bahru, 20 April 1937, Corner (SING); Perak: Bagan Serai, Krain, Feb. 1939, E. J. H. Berwick No. K 60 (SING). SUMATRA: Medan, May 1929, Ochse (Bz). JAVA: Batavia: Buitenzorg (250 m.), 6 April 1925, J. J. Ochse. "Cultivated; Local name Kemang (Sund.)" (Bz); Bidaratjina, Edeling. "*M. foetida* Lour. Var. Kwini" (Bz); Ragoenan, Pasar Minggoe, 5 Oct. 1926, Ochse. Djokdja: Goenoeng Kidoel, 23 Sept. 1928, Ochse (Bz). Pekalongan: Margasari (100 m.), 11 Sept. 1923, Tokkinga (Bz). Soebah 8.10.1891, Koorders 11383 B (*M. foetida* Lour. var. *Kawini* Miq.) (Bz). Boschdistrikt (125 m.), June 1920, A. C. Noltee. "Palem Koewini" (Bz); No. 407 H. B. ex Herb. Hort. Bot. Bogor (cultivated in Hort. Bogor. Local name Mangga Kawini), representing *Mangifera indica* L. var. *Kawini*=*M. odorata* (Bz). CELEBES ISLAND: 1913, Rachmat 364. (Bz). PHILIPPINES: Mindanao, 1901-1902, Capt. G. P. Ahern, Herb. Ahernianum No. 6589 (Bz).

Type.—MALACCA: Griffith No. 1098 in Herb. Kew, London.

Distribution.—MALAY PENINSULA: orchards of Malacca and Singapore (*type*), Perak, Kelantan, etc. JAVA. SUMATRA. CELEBES ISLAND. PHILIPPINES. BRITISH NORTH BORNEO. COCHINCHINA.

It is widely cultivated in the Malay Peninsula, Java, Philippines and French Indochina for its fruits.

Economic importance.—The young fruit is inedible like that of *M. foetida*. When ripe, the fruits are sweet, juicy, and edible, with a distinctive flavor. They are distinguished from fruits of *M. foetida* by their flavor and yellow color. The fruits are poor eating as the flesh is traversed by coarse fibres. The Malays use them also in curries, and make pickles from them with salt. However, the tree is cultivated for its fruits throughout Malaysia because a superior mango cannot be grown satisfactorily, owing to climate.

In the Medical Book of Malayan Medicine (Gard. Bull. S. S. 6, 1930, p. 334), the bark is recommended for external application in Hystero-epilepsy in the form of a compound cosmetic-like mixture. The sap in the bark is irritant.

Moll and Jansonnus (Mikrogr. d. Holzes Java, 2, 1908, p. 460) remark that the wood is microscopically very similar to that of *M. indica* (Burkill).

B. *Panicle tomentose*

39. MANGIFERA KEMANGA Blume Mus. Bot. Lugd. Bat., 1, 202 (1850); Miq. Fl. Ind. Bat., 1 (b), 634 (1859); Hook. f. in Trans. Linn. Soc., 23, 167 (1862), t. 23; King. in Journ. As. Soc. Beng., 65, 477 (1896); Pierre Fl. For. Cochinch., t. 364 N (1897); Ridl. Fl. Mal. Penin., 1, 525 (1922). Burkill Dict. Econ. Prod. Mal. Penin., 2, 1406 (1935).—*M. foetida* Bl. Bijdr., 1153 (1826), non Lour. *Manga foetida II (Wani)* Rumph. Herb. Amb., 1, 99 (1741); Merrill Interptn. Rumph. Herb. Amb., 330 (1917). *M. polycarpa* Griff. Not., 4, 416 (1854) t. 167, fig. 2; Hook. f. Fl. Brit. Ind., 1, 20 (1876); Engler in DC. Mon. Phan., 4, 213 (1883).

Local names.—Kemang, Camang (Malaya); Wani (Bali).

A big tree, 24 m. high. *Leaves* coriaceous, ovate-oblong, subacute or shortly and obtusely acuminate, narrowed to sessile flat base, grooved

above; nerves 20-30 pairs, more prominent below, 5-6 mm. apart, almost parallel, arched; reticulations faint on both surfaces; lamina 17-20 cm. x 6.5-7 cm. *Panicle* 30-75 cm. long, lax; peduncle erect stout, angled, covered by minute white hairs; with a rosette of triangular, acute, tomentose, spiral bracts at base; primary branches slender, nearly 18 cm. long; secondary branches 3-3.5 cm. long, from upper half of primary ones; tertiary about 1 cm. long; flowers densely clustered at apices of tertiary branches (all above measurements including flowers). *Flowers* subsessile, 6 mm. long, pinkish-purple; pedicels short, 1-2 mm. long. *Sepals* 5, erect, ovate, pubescent on back, 2.5 mm. x 1 mm. *Petals* 5, linear-lanceolate, acute, with 1 median ridge; attached to base of the pedicel-like disc; 4.5-5 mm. x 1 mm. *Stamens* 5, free; 1 fertile, shorter or as long as petals; staminodes very minute. *Ovary* globose; style lateral, longer than the petals. *Drupe* oblong, obliquely emarginate near apex; flesh white, juicy; stone lanceolate, not woody, abundantly fibrous; seed erect.

M. Kemanga was established by Blume, on his earlier species *M. foetida*, found under cultivation in Java, where it was known as *Kemanga*. Engler (1883), Pierre (1897), and Merrill (1923) reduced it to *M. caesia* Jack, due to its close affinity with the latter species, while King (1897) and Ridley (1922) maintained its separate status. Burkill (1935) confirmed its separation from *M. caesia* Jack and stated that the tree can be "recognised at any time by means of difference in the leaves and inflorescences."

Examination of the material obtained from different herbaria disclosed the following distinctions which justify its retention as a separate species.

M. CAESIA Jack	M. KEMANGA Blume
<i>Leaves</i> shortly petiolate, lateral nerves at intervals of 8-10 mm.	<i>Leaves</i> sessile, shorter; lateral nerves closer, at intervals of 5-6 mm.
<i>Panicle</i> 30-40 cm. long; peduncle and branches stout, tawny-tomentose.	<i>Panicle</i> 50-60 cm. or more long; peduncle erect, angular, slender covered with minute white hairs, less branched; tertiary branches above lower-half of secondary branches.
<i>Flowers</i> 1 cm. long.	<i>Flowers</i> 6 mm. long, less in number; pedicels shorter (1-2 mm.).
<i>Drupe</i> obovate-oblong, very big (18-19 cm.), base rounded; exocarp tomentose, dirty grey; stone elliptic.	<i>Drupe</i> oblong, base gibbous; stone lanceolate (Ridley).

I followed King in reducing *M. polycarpa* Griff. to this species. The vernacular name of *M. polycarpa* is "Camang" in Malacca, but in the archipelago it is Kemang, Komang or Kamanga.

Sheets examined.—MALAY PENINSULA: Malacca, Griffith. "Camang: a distinct species" (CAL). SUMATRA: at 500 ft., 1881, H. O. Forbes 3198 (CAL). JAVA: Blume ex Herb. Hort. Bot. Bog. (Bz); ex Herb. Hort. Bog. (cult.) (Bz).

Distribution.—In orchards and villages of SINGAPORE and MALACCA; islands of the MALAYAN ARCHIPELAGO.

Economic uses.—Its fruit is brown and juicy with a strong smell. It is used in curries for its sour flavor. The timber is pinkish in color, turning brown with age and is apparently a somewhat better wood than that of *M. caesia*, being more compact and firmer. The resin is acrid and injurious to the skin of wood cutters (Ridley Agric. Bull. Straits and F. M. S., 1, 107, 1901).

40. MANGIFERA CAESIA Jack in Roxb. Fl. Ind., ed. Carey and Wall., 2, 441 (1824); Cal. Journ. Nat. Hist., 4, 174 (1843); Walp. Ann. Bot. Syst., 1, 200 (1848-49); Griff. Not. 4, 415 (1854); Marchand Des Terebin., 191 (1869); Hook. f. Fl. Brit. Ind., 2, 19 (1876); Engler in DC. Mon. Phan. 4, 213 (1883); King in Journ. As. Soc. Beng., 65, pt. 2, 478 (1896); Pierre Fl. For. Cochinch., t. 364 M (1897); Merrill in Journ. Roy. As. Soc., S. Br., No. 66, 349 (1921); Ridl. Fl. Mal. Penin., 1, 525 (1922); Merrill Enum. Philip. Fl. Plants, 2, 468 (1923).

Local names.—Binjai (Malay); Bauno, Baluno (Philippines); Beluno, Ondo (British North Borneo); Wani (Bali); Bingloe or Kemang-Binglow, Kemang (Java); Medang-kemang, Kemang Hadji (Sumatra).

A stately magnificent, very handsome and showy *tree* when in flower, 30 m. or more in height; branches stout, rough from cicatrices of leaves. *Leaves* whorled at apex, subverticillate acylic lower below; thickly coriaceous; obovate-oblong, shortly and obtusely acuminate, attenuated at base; nerves 25-35 pairs at intervals of 8-10 mm., thin, straight except near margin; midrib stout, flattened; reticulations obscure; lamina 12-30 cm. x 5.5-9 cm., decurrent on 1-2 cm. long petiole. *Panicle* having a crown of conspicuous, triangular acute, tomentose, spiral bracts at base; erect, minutely tawny-tomentose, glaucous reddish, 30-40 cm. long; primary branches nearly 15 cm. long; secondary opposite or sub-opposite rarely alternate, variable in length (up to 6 cm.), tertiary about 1 cm. long (all above measurements including flowers); pedicels stout, tomentose, about 5 mm. long. *Flowers* pale lilac, 1 cm. long; bracteole broad, elliptic, 2 mm. long, densely pubescent outside; polygamous, male much more numerous than hermaphrodite, the latter when present terminal on each cyme. *Sepals* 5, lanceolate, subacute, erect, pubescent, 2.5-3 mm. x 1 mm., beautiful lilac inside except the margin. *Petals* 5, adnate to disc, linear, ridge one very conspicuous; margins usually inrolled; 8 mm. x 1 mm. *Stamens* 5, 1 fertile shorter than petal, anther small; staminodes very minute. *Disc* minute, stipitate. *Ovary* one-celled obliquely ovoid; style sub-terminal, longer than petals. *Drupe* edible (a popular fruit of the natives), obovate-oblong; 18-19 cm. x 9-10 cm.; right shoulder bulged above, slightly broader towards base; epicarp thick, reddish white, mesocarp fleshy; endocarp comparatively thin, coarsely fibrous; stone elliptic 7-7.5 cm. x 3.5 cm.; with a protruded stalk at base; cotyledons 2, elliptic, 1.5 cm. thick, almost filling up the cavity of the stone,

smooth; radicle adjacent to one side of the cotyledon; integument brown, coriaceous.

Var. *verticillata* (C. B. Rob.) Mukherji, stat. nov.—*M. verticillata* C. B. Robinson in Philip. Journ. Sci., 6, 337 (1911); Elmer Leaflet. Philip. Bot., 2381 (1914); Merrill Enum. Philip. Fl. Plants, 2, 468 (1923), in part.

Leaves in whorls of 4, elliptic-ovate to obovate; lamina 12–15 cm. x 4.5–6 cm. towards apex; petiole distinct, flattened, 2.5–3 cm. long. *Panicle* with strongly 4 angled branches and branchlets, verticillate or subverticillate in fours. *Sepals* oblong to ovate, 1.5–2 mm. long, puberulous. *Drupe* yellowish, oblong, cylindrically round, 10 cm. x 6.5 cm.

Specimens seen.—PHILIPPINES: Mindanao, Agusan, Cabadbaran (Mt. Urdanets), July 1912, Philip. Isl. Plants No. 13258 (CAL). BRITISH NORTH BORNEO: Papar, 2.7.32, Telado, For. Dept. No. 1931 "Beluno, Bundo" (Bz).

M. caesia was based on a collection of Jack from Sumatra, perhaps at Bencoolen, in the year 1820. Jack regarded the species as "very remarkable" and named it "caesia" probably because of the bright, attractive color of the panicle. Jack sent the description of the species to Wallich who inserted it in the revised edition of Roxb. Fl. Indica (1824).

M. verticillata C. B. Robinson was reduced by Merrill (Enum. Philip. Fl. Plants) to *M. caesia* Jack most likely because of the similarity in floral structure. I have compared the Philippine specimen named *M. verticillata* with a large number of specimens of *M. caesia* from different localities, and found that its verticillate leaves and inflorescence branches were quite distinct. Whorled leaves are not found in any other species of the genus, but characteristic of the genus *Bouea*. As whorled leaves are a distinct character of Robinson's species, I consider it necessary to treat it as a variety of *M. caesia* Jack.

Flowering.—September to November and June. *Fruiting*.—Mainly in February.

Sheets examined.—MALAY PENINSULA: Malacca: Griffith 1100 (CAL); Malaya: Maingay 465 ex Herb. of Late A. C. Maingay (CAL); Bruang, July 1883, J. S. Goodenough 1381 (SING); Feb. 1936, E. J. H. Corner. "Local name Binjai" (SING); Perak: Father Scortechini 187 and 189 ex Herb. Mus. Perak (CAL) (SING). Singapore: Holland Rd. 1892, H. N. Ridley (SING); Market, 4 July 1938, E. J. H. Corner (SING); Bot. Garden, March 1918, Md. Noor 1832 (cult.) (SING). SUMATRA: Palembang; Lematangitir, G. Megang (75 m.), 24 Nov. 1923, L. F. W. Dorst No. T 1004 "Kemang Hadji" (Bz); Banjoeasin, 12 Jan. 1916, W. Grashoff 905 (Bz); Lematang Deloe (110 m.), 1916, W. Grashoff 905 (Bz); Lampong; Menggala, 27 Nov. 1913, H. A. Gusdorf 28 (Bz); Bengkoelen: 22 July 1916, E. Jacobson. "Kemang" (Bz); Bengkalis: 1920, Beguin 405 (Bz). JAVA: Blume ex Herb. Hort. Bog. (CAL); Batavia, Buitenzorg, 20 Dec. 1895, S. H. Koorders. (Bz); Batavia, 30.10.1902, 12.9.1913, Koorders 37597 and 42212 "Cult." (Bz). Baringkok (250 m.), Feb. 18, 1924, R. C. Bakhuizen V/D Brink 6300. "Wild; local name Kemang" (Bz); Pasir Honje (300 m.), 10 Feb. 1924, R. C. Bakhuizen V/D Brink. 6282 "Cultivated; local name Bingloe or Kemang-Bingloe" (Bz). Djasinga 20 Nov. 1913, Backer 10097 (Bz). Bogor, 1900 Soegandiredja 29 (Bz); Tjijakoe, 17 Nov. 1924, Ochse. "Cult.; Kemang" (Bz); Bantam, Rangkas Bitoeng, 9 June 1911, Backer 1092 "Cult." (Bz). Prianger, Tasikmalaja, 2 Aug. 1917, Koorders 47763 (Bz). BALI: Nigara (40 m.), 2.9.18. R. Mair Sarip 199. "Local name

Wani" (Bz). BRITISH NORTH BORNEO: Mt. Kinabalu, Tuaran, Margin of paddy field, 27 June 1932, J. & M. S. Clemens 27743. "Tree 90 to 100 ft. high; flowers lavender, purple inside; fruit edible" (SING); Papar (cultivated), 2.7.32, Telado, For. Dept. No. 1931. "Fruit edible" (Bz); Mempakul, Kg. Bundu, Plain, 11.6.32, Goklin, For. Dept. No. 2293 (Bz); Bangney island, July to Sept. 1923, P. Castro and F. Melegrito 1693 (Bz); Pladjoe 3 June 1912, Amdjah 100 (Bz); Tawao, Elphinstone province, Elmer 21602 (Bz). BORNEO: Tarakan, Dec. 1935 (Bz); West Koetu, 18 Dec. 1931, G. H. Hinar 351 (Bz). PHILIPPINES: Tabuc, Basilan, Aug. 1918, A. Samonte, Forestry Bur. No. 27261 (Bz).

Distribution.—JAVA (cult.). BORNEO. PHILIPPINES (cult.). SUMATRA (type). BALI. MALAY PENINSULA: Malacca (cult.), Perak, Singapore.

Economic uses.—Cultivated in Singapore, Sumatra, Java, etc., for its edible fruits, though they are inferior in quality to those of *Mangifera indica*. The flesh is stringy. Malayanese are fond of the fruit, but the smell is certainly very objectionable.

The young leaves and seeds may be eaten (K. Heyne, Nutt. Plant. Ned. Ind. p. 966, 1927; Ochse, Vegetables Dutch E. Ind., p. 39, 1931). The leaves are not cooked, but used for flavoring other food, where in season young fruits would be employed (Burkill Dict. Econ. Prod. Mal. Penin., 2, p. 1402, 1935).

When available the timber is said to be used for boards in the Dutch Indies. Ridley describes it as light red, marbled with yellow, with distinct rings (Agric. Bull. Straits and F. M. S., 1, p. 524, 1922).

41. *MANGIFERA SUPERBA* Hook. f. Fl. Brit. Ind., 2, 19 (1876); Engler in DC. Mon. Phan., 2, 214 (1883); King in Journ. As. Soc. Beng., 65, 478 (1896); Pierre Fl. For. Cochinch., t. 365 D (1897); Ridl. Fl. Mal. Penin., 1, 525 (1922).

Local name.—Beechee (Singapore).

A very large *tree*; branches terminating into a crown of lanceolate, pubescent, 8 mm. long scales. *Leaves* large, stiff, very thickly coriaceous, cuneate-ob lanceolate, acute; margins slightly undulate, gradually narrowed from the upper third to the short flattened stout petiole; midrib very stout, flattened on upper, raised on lower surface; lateral nerves about 30 pairs; reticulations obscure; lamina 20–36 cm. x 6–9.5 cm. *Panicle* terminal, much longer than leaves (50–60 cm.), tawny-pubescent; peduncle very stout, with many lanceolate woody bracts at base; primary branches sub-erect with short branchlets crowded near apex; flowers densely crowded at apex of branchlets; bracts numerous, large, broadly lanceolate, pubescent. *Flowers* about 2 cm. long, lilac; pedicels very short. *Sepals* 5, ovate-lanceolate, concave, russet-ferruginous at back, 11 mm. x 5 mm. *Petals* 5, nearly twice as long, adnate to the cylindric torus; lanceolate, acuminate, recurved; ridge single, thick; 2 cm. x 4 mm. *Disc* slender, pedicel-like. *Stamens* 5; 1 with perfect anther, others with imperfect small anthers; filaments subequal. *Ovary* obliquely ovoid; style slender, subterminal, elongated, longer than stamens; ovule laterally attached, horizontal. *Drupe* "ellipsoid or oblong, 9.5 cm. x 5 cm.; flesh green or whitish, acidic" (Pierre's description from an unripe fruit).

The species is based on Maingay's collections from Malacca. The plant is very conspicuous in having the biggest flower and inflorescence

among the *Mangiferas*, and possessing a large crown of bracts at the base of the peduncle. It is curious that no one but Maingay should have met with so conspicuous a tree. The only other record of its presence was made by Pierre from localities near Singapore where he found it cultivated under the name of Beechee.

Sheets examined.—MALAYA: Malacca: Maingay No. 476 (*co-type*) (CAL); Johore, S. Bekok, 8.5.1938, Corner 34969 (SING).

Type.—Maingay No. 476, 1499 from Malacca in Herb. Kew, London.

Distribution.—MALACCA (*type*). SINGAPORE (cultivated).

SPECIES DUBIAE

1. *MANGIFERA LANGONG* Miq. Fl. Ind. Bat., Suppl. 1, 521 (1860); Engler in DC. Mon. Phan., 4, 215 (1883).

Local name.—Langong (Malayan).

Tree, branches angular. *Leaves* chartaceous, oblong-lanceolate to lanceolate, shortly apiculate, base acute or sub-cuneate; nerves about 30 pairs, close; reticulations more prominent beneath; lamina 17–32 cm. x 5–9 cm.; petiole semi-round, slender, 1.25–5 cm. long. *Flowers* unknown. *Drupe* subglobose, compressed.

Miquel considered it to be allied to *M. Taipan* Miq. In the absence of any flowering specimen in the collections, the species is here included as doubtful.

Sheets examined.—WEST SUMATRA: Rau, Diepenhorst No. 2333 H. B. "Vern. Langong (Malayan)" (*co-type*) (Bz); Medan, May 1929, J. J. Ochse. "Cultivated. Vern. Asam Koembang" (Bz); Priaman, Diepenhorst No. 2333 ex Herb. Sulp. Kurz. "Langong" (CAL).

Type.—Diepenhorst No. 2333 from Rau, West Sumatra in Herb. Utrecht.

Distribution.—SUMATRA.

2. *MANGIFERA LAXIFLORA* Desr. in Lam. Encycl., 3, 697 (1789); DC. Prodr., 2, 63 (1825).

A tree looking like *M. indica*. *Leaves* subsessile, ovate-lanceolate. *Panicle* much elongated, lax. *Flowers* imperfectly known. *Calyx* divided; lobes obtuse. *Androeceum* pentandrous. *Drupe* ovate, subrotundate, small.

The author of the species regarded it as closely related to *M. indica* Linn., but differing in the longer lax panicle, pentandrous flowers with obtuse, divided calyx, and the smaller globose fruits.

However, the species appears to me to be closely allied to *M. pentandra* Hook. f., with which it may have to be merged. In the absence of any material the matter could not be decided.

Type.—Martin and Stadman's specimen from the Isle of France in Herb. Roeper.

Distribution.—MAURITIUS: Isle of France (*type*).

3. *MANGIFERA MUCRONULATA* Blume Mus. Bot. Lugd. Bat., 1, 201 (1850); Miq. Fl. Ind. Bat., 1 (b), 633 (1859); Engler in DC. Mon. Phan., 4, 215 (1853).

Tree 10–13 m. high; branches distinctly angular. *Leaves* subcoriaceous, lucid above, elliptic to elliptic oblong, mucronate, attenuated at base; reticulations obsolete on both surfaces; lamina 13–18 cm. x 6–8 cm.; petiole 2.5 cm. long. *Flower and fruit* unknown.

According to Miquel and Engler it is closely allied to *M. rigida* Blume, differing mainly in the thinner leaves. No specimen could be secured by me.

Type.—Zippelius' specimen from New Guinea in Herb. Ultraject.

Distribution.—NEW GUINEA.

4. *MANGIFERA PARVIFOLIA* Boerlage and Koorders in Koord.—Schum. Syst. Verz., 2, 5. Abt. (Lief. 2), 31 (1910).

Local names.—Sekekia, Membatjang hoetan, Mempelán hera (Sumatra). Rawa, Aris (Borneo).

Tree 20 m. high; branches slender trichotomous dormant buds round, scaly; ultimate branches 2 mm. thick. *Leaves* alternate, aggregated at apex; thickly coriaceous, shining on both sides, elliptic, base acute, apex sharply acuminate; nerves 8–10 pairs, obsolete; 7–9 cm. x 2.25–4 cm.; petiole semi-round, grooved above, 1–2 cm. long. *Flower* unknown. *Drupe* elliptic, 4 cm. x 2.8 cm., at the end of a stout elongated peduncle.

The following remarks of the authors of the species will show the doubtful status of the species: "Though the material is insufficient yet it can be said to approach much nearer the genus *Mangifera*. It is distinct by its small leaves and branches. The leaves look somewhat like *Bouea burmanica* Griff., but differ from the latter in being alternate instead of being opposite" (Note on type sheet). The fruit has been described by me.

Sheets examined.—Central SUMATRA: 27.3.91. Koorders 21218 B (*co-type*) (Bz). East Sumatra: Bengkalis, Isir Koemboeng (3 m.), 3.11.26 (Bz). Selatpandjang, Kampar Monding (5 m.), 9 March 1937, M. Sewandono 31 (Bz). WEST BORNEO: Simpang, Djenoe, 17.8–28 (Bz); Mempawah, 13.5.30 (Bz).

Type.—Koorders 21218 B from Central Sumatra.

Distribution.—Central and eastern SUMATRA (*type*); WEST BORNEO.

5. *MANGIFERA REBA* Pierre Fl. For. Cochinch., t. 363 B (1897); Lecomte Fl. Indoch., 2, 19 (1908); Crevost and Lema Cat. Prod. Indoch., 1, 234 (1917); Burkill Dict. Econ. Prod. Mal. Penin., 2, 1401 (1935).

Local names.—Svai reba, Svai meas (Cambodia); Xoai som (valley of Dongnai, Cochinchina).

Tree 35 m. high; branches angular when young. *Leaves* oblong-lanceolate, acute or obtuse at base, shortly acuminate at apex, tip blunt or mucronate, subcoriaceous, rigid, shining above; nerves 18–22 pairs, very fine, slightly more prominent above; reticulations prominent on both faces; lamina 12–16 cm. x 3–5 cm.; petiole semi-round, 1–2.5 cm. long. *Inflorescence* fructiferous, terminal, 20 cm. or more long; clothed with dense, short, grey hairs; branches 6–9 cm. long. *Flowers* unknown. *Fruit* curved near apex, compressed, blunt at tip, atten-

uated at base when young. Stone elliptic, rounded at apex, fibrous; ribbed with raised, stout nerves; 8 cm. x 7.8 cm. x 3.8 cm.; integuments thin, dark-brown.

Pierre described the species from fruiting specimens of a tree found in a single locality. He was doubtful about its position, as the flowers were not known. As no flowering specimens have since been collected, it is here included as doubtful. I was unable to secure any material of this species.

Pierre found that the leaves and especially the stones of this sp. are very distinct. This tree resembles considerably *M. campiosperma* Pierre in its raised nerves on the stone and the erect inflorescence branches, but differs from the latter species in the shape of the endocarp. The stem contains resin canals both in the bast and in the pith, a character common also to some other species of the genus. Its limb is one-third less in diameter than that of *M. foetida* and *M. indica*, and two-thirds less than that of *M. kemanga*. Its affinity with *M. indica* is supported by the nature of the epidermis and the reduced or crushed hypodermis. *M. kemanga* Bl. differs in having a single continuous layer of sclerenchymatous cells below the epidermis.

Type.—Pierre No. 1648 from valley of Dongnai, Annam, in Herb. Mus. Paris, France.

Distribution.—FRENCH INDOCHINA: Annam, Valley of Dongnai (*type*).

Economic uses.—Its fruits are harvested by the natives. The wood is almost as useful as that of *M. indica* (Pierre, Crevost & Lemarie).

6. MANGIFERA TAIPA Buch.—Ham., in Mem. Wern. Soc., 5, 326 (1826).—*Manga sylvestris altera* Rumph. Herb. Amb., 1, 97 (1741); Merrill Interptn. Rumph. Herb. Amb., 331 (1917). *Mangifera membranacea* Bl. Mus. Bot. Lugd. Bat., 1, 195 (1850); Engler in DC. Mon. Phan., 4, 215, (1883). *Mangifera Taipan* Ham. ex Miq. Fl. Ind. Bat., 1 (b), 631 (1859).

Local names.—Taipa, Way Way, Ouw (Amboina).

Tree with more lofty and straight trunk than *M. indica*. *Leaves* sparse, membranaceous, oblong-lanceolate, shortly and obtusely acuminate or sub-acute, base cuneate; nerves prominent on both sides; reticulations obsolete; lamina 12.5–35 cm. x 4–10 cm.; petiole 2.5–5 cm. *Panicle* lax, terminal. *Fruit* pilose.

This species is based wholly on Rumphius' description and is very doubtful. The correct epithet for the species should be *Taipa* as originally designated by Hamilton, and not Miquel's *Taipan*.

Blume referred part of this species to *M. membranacea* Bl. but Hamilton's name, being older, should be maintained, if future investigation shows the species to be distinct.

Distribution.—MOLUCCA. NEW GUINEA.

7. MANGIFERA UTANA Buch.—Ham., in Mem. Wern. Soc., 5, 326 (1826); Miq. Fl. Ind. Bat., 1 (b), 634 (1859).—*Manga sylvestris prima* Rumph. Herb. Amb., 1, 97, t. 27 (1741); Merrill Interptn. Rumph.

Herb. Amb., 330 (1917). *Mangifera glauca* Blume Bijdr., 1158 (1826); Mus. Bot. Lugd. Bat., 1, 201 (1850); Engler in DC. Mon. Phan., 4, 214 (1883).

Local name.—Manga utan.

Leaves chartaceous, glaucescent beneath, elliptic-oblong, attenuated at both ends. *Panicle* terminal, spreading, shorter than leaves. *Flowers* unknown. *Fruit* glabrous.

Rumphius' figure and description are the basis of this species. Blume (1850) referred part of *M. Utana* to *M. glauca*. Engler (1883) accepted Blume's treatment, but Miquel (1859) reduced *M. glauca* Bl. to this species. In accordance with the International Rules of Botanical Nomenclature, I accept Miquel's treatment of *M. glauca* as a synonym of this species.

M. Utana is of doubtful status as it is apparently not very different from *Manga domestica* Rumph. (*M. indica*).

Flowering.—July.

Distribution.—MOLUCCA ISLAND.

8. *MANGIFERA XYLOCARPA* Lauterb. in Engl. Bot. Jahrb., 56, 354 (1921).

Tree 25 m. high; branches round, 5–10 mm. thick; bark greyish brown. *Leaves* lanceolate, coriaceous, shining above, shortly acuminate, base cuneate, margins entire sub-revolute; lateral nerves 11–12 pairs; reticulations prominent beneath; lamina 17–30 cm. x 6–8 cm.; petiole 8–15 mm. long. *Panicle* axillary, laxly flowered. *Flowers* unknown. *Drupe* ovoid, compressed, slightly oblique near apex, lively rosy; 6.5 cm. x 5 cm. x 3.5 cm.; flesh thin, not fibrous; endocarp nearly 10 mm. thick, corky towards the middle, not fibrous; stone 4 x 2 cm., ruminated outside; embryo ovoid-oblong, compressed.

The affinity of this species is doubtful. To date it has been distinguished only by the glabrous endocarp. (Lauterb). No specimen seen by me.

Type.—Lederman No. 10757 from New Guinea in Herb. Mus. Berolinense.

Distribution.—North-East NEW GUINEA, from Malu as far as Sepik, in secondary woods at 20–40 m. altitude.

Economic uses.—The fruit is harvested by the natives (Lauterb.).

NOMINA NUDA

1. *M. balba* Gen. ex Crevost & Lemarie, Cat. Prod. Indoch. 1, 235 (1917).
2. *M. equina* Gen. ex Crevost & Lem., l. c., 1, 235.
3. *M. Gandaria* Roxb. Hort. Beng., 18 (1814).
4. *M. oryza* Gen. ex Crevost & Lem., l. c., 1, 235.

SPECIES EXCLUDENDAE

1. *M. africana* Oliver, Fl. Trop. Afr., **1**, 443 (1869).
I follow Engler in excluding this species from *Mangifera* in view of its meagre description and unusual distribution for the genus.
2. *M. amba* Forsk. Fl. Aegypt. Arab., 205 (1775) = *M. indica* L.
3. *M. anisodora* Blanco, Fl. Philip., ed. 2, 129 (1845) = *M. India* L.
4. *M. arbor* Hermann, Mus. Zeyl., 59 (1717) = *M. indica* L.
5. *M. axillaris* Desr. in Lam. Encyc., **3**, 697 (1788) = *Buchanania* Lanza Spreng.
6. *M. Curtisii* Heyne Nutt. Pl. Ned.-Ind., **3**, 126 (1917) = *Melanorrhoea Curtisii* Oliver.
7. *M. domestica* Gaertn. Fruct., **2**, 95, t. 100 (1791) = *M. indica* L.
8. *M. foetida* Blume Bijdr., 1153 (1826) = *M. Kemanga* Blume.
9. *M. foetida* Griff. Notul., **4**, 419 (1854) = *M. foetida* Lour.
10. *M. foetida* Lour. var. *odorata*, *cochinchinensis* and *Kawinii* Pierre Fl. For. Cochinch., t. 365 B, E, and F (1897) = *M. odorata* Griff.
11. *M. fragrans* Maingay Mss. in Hook. f. Fl. Brit. Ind., **2**, 18 (1876) = *M. macrocarpa* Blume.
12. *M. gabonensis* Aubry-Le Comte ex O'Rorke in Journ. Pharm. et Chim., sér. 3, **31**, 275 (1857) = *Iringia Barteri* Hook. f.
13. *M. gladiata* Boj. Hort. Maurit., **73** (1837) = *M. indica* L.
14. *M. glauca* Rottb. in Nye Saml. Danske Vidensk. Selsk. Skr. **2**, 534, t. 4, fig. 1 (1783) = *Elaeodendron glaucum* Pers.
15. *M. glauca* Spanoghe in Linnaea, **15**, 188 (1841) = *M. timorensis* Blume.
16. *M. glauca* Blume Bijdr. 1158 (1826) = *M. Utana* Buch.-Ham.
17. *M. Horsfieldii* Miq. Fl. Ind. Bat. **1** (b), 632 (1859) = *M. foetida* Lour.
18. *M. indica* Blume Bijdr., 1157 (1826) = *M. foetida* Lour.
19. *M. indica* Thw. Enum. Pl. Zeyl. 75 (1858) = *M. zeylanica* Hook. f.
20. *M. indica* Wall. Cat. 8487 I (1828) = *M. sylvatica* Roxb.
21. *M. integrifolia* Gén. ex Crevost & Lem. Cat. Prod. Indoch. **1**, 234 (1917) = *M. indica* L.
22. *M. Kukula* Blume Mus. Bot. Lugd. Bat., **1**, 192 (1850) = *M. indica* L.
23. *M. laurina* Blume Mus. Bot. Lugd. Bat., **1**, 195 (1850) = *M. indica* L.
24. *M. Leschenaultii* March. Des Terebinth. 189 (1869) = *M. foetida* Lour.
25. *M. Linnaei* Korth. ex Hassk. Cat. Hort. Bog. Alt., 245 (1844) = *M. indica* L.
26. *M. mariana* Buch.-Ham. in Mem. Wern. Soc., **5**, 326 (1826) = *Bouea burmanica* Griff.
27. *M. maritima* Lechaume in Rev. Hortie. 369 (1870-71) = *M. indica* L.
28. *M. membranacea* Blume Mus. Bot. Lugd. Bat., **1**, 195 (1850) = *M. Taipa* Buch.-Ham.
29. *M. montana* Heyne ex Wight & Arn. Prod., 170 (1834) = *M. indica* L.
30. *M. oppositifolia* Roxb. Hort. Beng., 18 (1814) = *Bouea burmanica* Griff.
31. *M. Parih* Miq. Fl. Ind. Bat., **1** (b) 630 (1859) = *M. longipes* Griff.
32. *M. Parkinsonii* Fischer in Kew Bull., 84 (1927). This is a *Swintonia*, most probably *S. floribunda* Griff.
33. *M. parvifolia* Merrill in Philip. Jour. Sci., **20**, 401 (1922) = *M. Merrillii* nom. nov.
34. *M. pinnata* Desr. in Lam. Encycl. **3**, 697 (1788) = *Sorindeia madagascariensis* DC.
35. *M. pinnata* Linn. f., Suppl. 156 (1781) = *Spondias mangifera* Willd.
36. *M. polycarpa* Griff. Notul., **4**, 416 t. 167, f. 2 (1854) = *M. Kemanga* Blume.
37. *M. racemosa* Boj. Hort. Maurit. **73** (1837) = *M. indica* L.
38. *M. racemosa* Lam. Illustr., **2**, 113 (1793) = *Holigarna Arnottiana* Hook. f.
39. *M. rostrata* Blanco Fl. Philip., ed. 2, 129 (1845) = *M. indica* L.
40. *M. rubra* Boj. Hort. Maurit. **76** (1837) = *M. indica* L.
41. *M. sativa* Roem. & Schult. Syst., **1**, 37 in obs. (1817) = *M. indica* L.
42. *M. silvestris* König ex Roxb. Fl. Ind., ed. Carey, **2**, 385 (1832) = *Buchanania latifolia* Roxb.
43. *M. sugenda* Gén. ex Crevost & Lem., l. c. 234 (1917) = *M. cochinchinensis* Engl.
44. *M. sumatrana* Miq. Fl. Ind. Bat., **1** (b) 630 (1859) = *M. longipes* Griff.
45. *M. Taipan* Ham. ex Miq. l. c., 631 (1859) = *M. Taipa* Buch.-Ham.
46. *M. verticillata* C. B. Robinson in Philip. Jour. Sci., **6**, 337 (1911) = *M. caesia* Jack var. *verticillata* stat. nov.
47. *M. viridis* Boj. Hort. Maurit. **73** (1837) = *M. indica* L.

SUMMARY

Mango, a member of the genus *Mangifera*, has long been known by the people of India. De Candolle is of the opinion that mango

has been under cultivation for over 4,000 years. It is mentioned freely in early Sanskrit literature, and in the travel notes of foreigners who visited India between the seventh and sixteenth century A. D.

The cultivated varieties of Indian mango, the finest in the world, are the product of a determined drive to improve the fruit by the Muhammedan Emperors in India during the 16th century.

Carolus Clusius (1605) was the first botanist to write about mango. Hermann (1670-77) learned about it in Ceylon, where he collected a large number of plants. Linnaeus subsequently examined Hermann's specimens and published his *Flora Zeylanica* (1747) in which he included the mango tree, as *Mangifera arbor*, the name taken from Hermann's list. The specific name was subsequently changed to *Mangifera indica*, when the genus was established by Linnaeus (1753) on that single species. No specimen has been preserved as the type of the species on which the genus *Mangifera* is based.

Since the establishment of the genus by Linnaeus, the number of valid species has increased to 65 according to the list given in "Index Kewensis," due to the discovery of plants from different areas mainly by Roxburgh, Blume, Griffith, Hooker, King, Pierre and Merrill.

The first revision of the genus by Marchand (1869) dealt with only 11 species. It was studied by Engler (1883) who recognized 28 valid species and 4 doubtful ones.

The present paper deals with all species critically examined on the basis of the sheets obtained from all important Asiatic herbaria. Drawings of floral structures of all species previously not illustrated were made. Most descriptions were revised and amended, and the others completed. The treatment of each species includes full literature references, synonymy, local names, distribution, type, flowering and fruiting time, economic uses, and a list of herbarium specimens on which the analysis is based. A key for identifying all species has been prepared.

The number of species recognized as valid in this paper is 41, whereas 8 species are regarded as doubtful, 4 names are "nomina nuda," and 47 names have been excluded from the list of valid species as synonyms of some other species of *Mangifera* or of other genera. One new species, three new varieties, one new name and one transfer to new status are proposed.

The pre- and post-Linnean history of the genus is recorded in the introduction. A chart has been prepared showing the geographical distribution of the species.

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*Names set in italics indicate synonyms, names of sections, and pre-Linnean names for *Mangifera*.

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